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NITRILE RUBBER LATICES AS PERMANENT ABRASION-RESISTANT FINISHES FOR BLUE DENIM FABRIC*

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Synthetic rubber latices, especially acrylonitrile - butadiene mixtures, have been applied to blue denim yarn as a warp size. Fabric woven from these yarns has an initial abrasion resistance equal to that for starch-sized fabric. However, after standard launderings the latex-sized fabric increases in abrasion resistance. After 5 launderings the abrasion resistance is approximately 100% greater than that of the original fabric. Similar tests on starch-sized fabric show a progressive decrease in abrasion resistance until the fifth laundering at which the abrasion resistance is equal to that of desized fabric.

In addition to increased abrasion resistance, the latex finish prevents color bleaching during laundering and also prevents crocking and transfer of color to other fabrics during laundering and during ironing. White fabrics, in contact with latex-sized denim remain white throughout laundering and even when ironed in contact with one another.

Microscopic examination shows that the latex surrounds the denim yarn in a net-like structure. As the fabric is pressed with a hot iron after each laundering there is a slight softening of the latex and a slight redistribution. Possibly the latex is cured somewhat after each ironing, thus increasing the resistance to abrasion.

Problems related to mill application are also discussed.

INTRODUCTION

RUBBER and rubber-like materials have a long history as coatings for fabrics, especially for cotton textiles. These coatings have been applied from colloidal solutions in organic solvents, and with less success, from the latex itself. The application of natural rubber latex to cotton textiles gave poor adhesion and this was found to be due to the fact that the serum penetrated between the fibers, but the particles of rubber were too large to pass through the interfibrillar spaces. More recently the addition of wetting agents to rubber latices has improved the penetration of the rubber particles.

Applications of rubber latex to cotton textiles include artificial leather, treatment of carpet and rug backs to anchor the pile and to serve as a skid-proof base, waterproofed cloth, rubberized fabrics for transmission and conveyor belts, hose, and tire cord. In all cases a rather high concentration of rubber solids is deposited on the fabric or yarn ——— perhaps as much as 50 per cent of the weight of the cotton. Thus, Marsh states *(1)*, "Unfortunately, even the feel and handle of the best rubberized textile material is not acceptable when dress goods are considered: ..... This fact has prevented the use of rubber in finishing dress goods generally, and limited its application to proofing, bonding, and other special effects."

In the course of investigating synthetic materials as finishing agents for cotton fabrics, we also investigated the synthetic rubbers in their latex form. At the time, it was our practice to apply various concentrations of selected materials to desized cotton chambray and to desized blue denim fabric. Our objective was to improve or upgrade cotton fabrics. Blue denim is normally made from relatively short staple cotton averaging 15/16 inch in length. The yarn is colored with indigo, which is actually a pigment rather than a dye. The blue color is entirely on the surface of the yarn and is easily removed by abrasion. Moreover, the abrasion resistance of blue denim fabric is inferior to the tighter twist twill fabrics. Thus, denim is a good candidate for upgrading.

TABLE I
ABRASION RESISTANCE OF VARIOUS LATICES AS FINISHES ON DESIZED BLUE DENIM*

latex	*pickup (%)*	*Stoll abrasion* 1 lb head —1 lb yoke*
nitrile (high acrylonitrile)	9.9	1520
butadiene-styrene (low styrene)	10.4	480
butadiene-styrene (high styrene)	10.2	645
polyacrylate	9.7	555
polyvinyl chloride (preplasticized)	10.2	420
untreated control	0	320

* Abrasion tests run on treated fabrics which had been laundered five times by modified ASTM No. 3 wash test.

TEST RESULTS AND OBSERVATIONS

Preliminary tests were run on desized blue denim in a laboratory padder. Several types of synthetic high polymer latices were applied at 10 per cent solids on the fabric. They were laundered five times by a modified ASTM No. 3 wash test and evaluated for abrasion resistance in a Stoll Abrader. Results are shown in Table I and it can be seen that the nitrile latex had the best resistance to abrasion after laundering.

Therefore, a quantity of 8-oz blue denim fabric was desized with enzyme and was impregnated with the nitrile latex on a laboratory Butterworth padder to give a 10 per cent pickup. Abrasion resistance was tested before and after each of five laundering cycles. Table II shows that, even before laundering, there is a difference in resistance to abrasion among the samples. The desized sample required 310 cycles on a Taber Abraser to develop its first break. The mill-sized (starch) fabric was next with 368 cycles, and the nitrile-sized fabric next with 565 cycles. In all

* Presented at the Second Chemical Finishing Conference sponsored by the National Cotton Council at the Statler Hotel, Washington, D C, October 8, 1953.

of these abrasion resistance tests, it was noted that, as the abrading wheels ran over the fabric, the nitrile-sized fabrics retained their blue color for the largest number of cycles.

After each Launder-Ometer cycle, a break in the fabric occurred with less abrasion by the Taber Abraser wheels. The resistance to abrasion of the desized fabric rose slightly to 320 cycles, but then fell rapidly until, by the fifth wash, the first break occurred after only 215 cycles. The resistance to abrasion of the mill-sized fabric also dropped rapidly and after five launderings had the same resistance to abrasion as the desized fabric. However, the resistance to abrasion of the nitrile-sized fabric dropped to 490 cycles after the first laundering and dropped slowly thereafter to a final reading of 405 cycles after the fifth laundering.

The nitrile-sized fabric had an excellent hand both before and after laundering. After each laundering cycle it was noted that the wash water was not colored whereas the wash water from the starch-sized sample was milky blue.

Up to this point it had been demonstrated that the resistance to abrasion of blue denim fabric can be improved by aftertreatment with a nitrile latex. However, from a practical standpoint, aftertreatment of blue denim fabric is not feasible. The manufacture of blue denim does not involve desizing or any special finishing treatment except Sanforizing. Thus, usually, there are no facilities in a denim mill for preparing denim fabric for aftertreatment or for finishing.

It would be more practical if the latex could be applied to the warp yarn in place of starch size prior to weaving. The increased resistance to abrasion of the yarn should permit adequate weaving. Since denim construction has its warp yarns mainly on the surface, nitrile treatment of the warp might provide the desired increase in abrasion resistance.

Blue denim yarns were slashed with the nitrile latex used in the previous experiments in a 168-end laboratory slasher and hot air oven drier *(2)*. (See Figures 2-6). Concentrations of latex solids in the size bath were varied between 0.4 per cent and 19.7 per cent. Table III shows the results. All but the highest concentration, 19.7 per cent of latex, helped to give excellent slashing. The highest concentration caused the yarn to stick together so that it was difficult to split at the lease rods. Nevertheless, it was possible to slash more than 100 yards of yarn for the necessary tests which included abrasion resistance on the Walker Abrader (Figure 7) and shed tests on the SRI Shed Tester. (Figure 8). The results show that, as the concentration of nitrile solids is increased, the yarn abrasion resistance increases until a maximum is reached at about 6 per cent. Additional latex does not improve the abrasion resistance. At the same time an acceptable shed value is obtained at the 6 per cent concentration. These results are shown graphically in Figure 1.

As a result of this experiment a wide

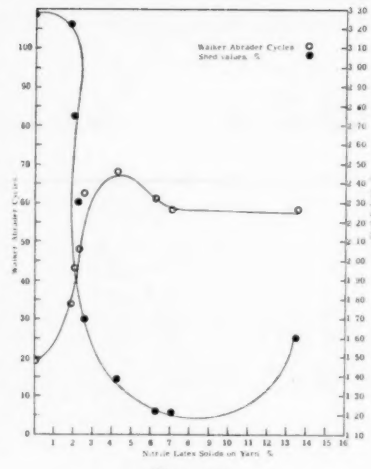

Figure 1
8.75s blue denim yarn sized with nitrile latex

TABLE II
ABRASION TESTS OF DESIZED BLUE DENIM FABRIC FINISHED WITH NITRILE LATEX

*abrasion cycles to first break**

Launder-Ometer cycle	*desized*	*mill-sized*	*nitrile-sized*
0	310	368	565
1	320	349	490
2	271	288	462
3	243	258	444
4	226	232	413
5	215	217	405

* CS-10—Calibrase wheels with 1000-gram weights.

TABLE III
RESULTS OF TESTS ON 8.75s BLUE DENIM YARN SIZED WITH NITRILE LATEX

nitrile latex solids in size bath (%)	*nitrile latex solids on yarn (%)*	*condition of slashing*	*abrasion cycles (avg)*	*shed (%)*
0	...		18	3.27
0.4	1.8	excellent	34	3.22
1.2	2.0	excellent	43	2.75
2.0	2.2	excellent	48	2.30
3.9	2.5	excellent	62	1.70
5.9	4.2	excellent	68	1.39
7.9	6.1	excellent	61	1.22
9.8	7.0	excellent	58	1.21
19.7	13.4	splits with great difficulty	58	1.60
starch control	8.6		38	1.30

Size box temperature—75° F
Dry box temperature—300° F

TABLE IV
RESULTS OF TESTS ON 8.75s BLUE DENIM YARN SIZED WITH VARIOUS SYNTHETIC LATICES (SIZE BATHS CONTAINED 6% OF LATEX SOLIDS)

no.	*latex type*	*average particle size microns(3)*	*pickup % on yarn*	*shed (%)*	*abrasion cycles (avg)*	*breaking strength lb**
1	unsized	...	...	3.27	18	3.13
2	starch control	...	8.60	1.30	38	3.34
	butadiene-acrylonitrile					
3	high nitrile	0.06	4.08	1.57	67	3.36
4	high nitrile	0.20	5.26	1.84	42	3.15
5	high nitrile	0.10-0.15	4.21	1.54	60	2.98
6	high nitrile, modified	0.12	5.26	1.38	59	3.43
7	medium nitrile	0.06	4.82	1.79	42	2.99
8	medium nitrile synthetic emulsifier	0.06	4.37	2.10	46	3.17
9	medium nitrile synthetic emulsifier	0.06	4.08	2.37	53	2.90
10	medium nitrile, cationic	0.06	3.04	2.71	46	3.08
	butadiene-styrene					
11	very high styrene	0.06	4.82	4.01	19	3.24
12	high styrene	0.18	3.08	1.81	54	3.40
13	low styrene	0.12	4.37	1.08	64	2.98
	polyacrylic					
14	polyacrylic ester	0.18	4.97	1.28	61	3.20
15	polyacrylic acid	solution	2.53	2.03	51	3.41
16	sodium polyacrylate	solution	7.32	0.94	47	3.17
17	ammonium polyacrylate	solution	3.08	0.96	42	3.21
	polyvinyl chloride					
18	liquid plasticized	0.19	5.11	2.68	32	3.28
19	rubber plasticized	0.18	3.38	2.38	30	3.38
20	internally plasticized	0.18	1.77	4.95	24	3.24
21	internally plasticized	0.18	4.37	1.08	53	2.98
22	***polyvinylidene chloride***	0.17	3.77	2.92	26	3.25

* 10 inch gauge length.

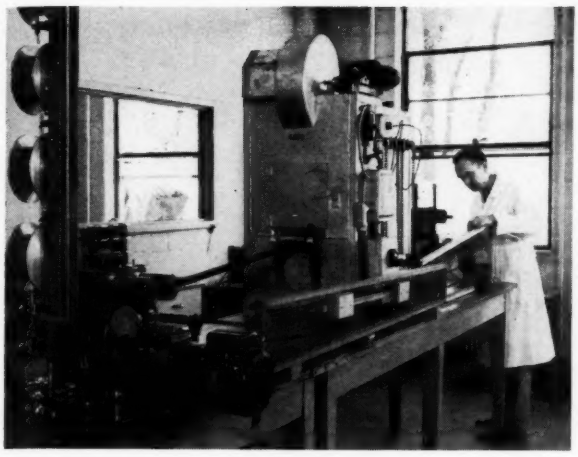

Figure 2
SRI slasher

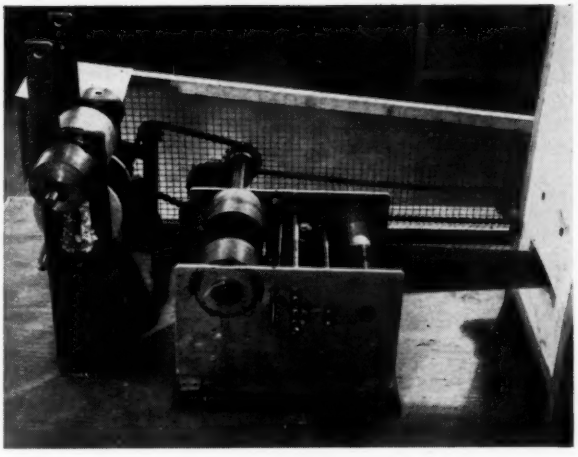

Figure 4
Split rods and take-up of SRI slasher

range of synthetic polymer latices was used to size blue denim yarn. To simplify the experiment, all latices were made up to a 6 per cent size bath. In Table IV it may be seen that, whereas all size baths contained 6 per cent solids, the yarn pickup of solids varied for the different latices. However, there is no direct correlation between pickup and physical characteristics. For example, two of the high nitrile polymers have a pickup of 5.26 per cent of solids, yet they have different shed values, Walker Abrader values, and breaking strength.

Of all the nitrile latices tested, those of high nitrile content appeared to give best results for improvement of abrasion resistance. And of these, the one having the smallest particle size (0.06 microns) was the best. This is represented as number 3 in Table IV. It will be noted that number 6, high nitrile, modified, appears to give the best results. It had the lowest shed value (1.38 per cent) and the highest breaking strength (3.43 lbs). However, the Walker Abrader value is less than that for number 3 and subsequent laundering tests have shown that this

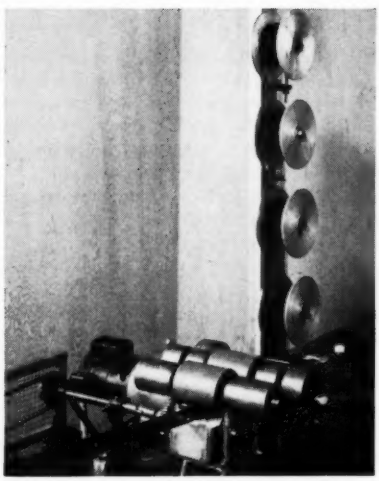

Figure 3
Creel and size box of SRI slasher

latex does not have the permanence of Sample 3. Also, it may be noted that other materials listed in the table also had good abrasion values and low shed but in each case the permanence to laundering was inferior to that of number 3. Number 3 was Hycar 1561, a water emulsion of a butadiene-acrylonitrile copolymer. In view of its superior qualities, it was decided to run mill trials with this particular latex. These trials were run at Wetumpka, Alabama, in co-operation with Alabama Mills.

At Wetumpka, slashing was carried on in the usual manner except that the size box was not heated. Five separate mill trials were run to develop a suitable method of application. Problems which arose (and which were subsequently solved) included: concentration of Hycar 1561 in size box to give pickup of 6-8 per cent on yarn, squeeze-roll pressure to achieve proper pickup, type of squeeze-roll (rubber or wool-covered), sticking of Hycar 1561 to hot dry cans, and accumulation of Hycar 1561 on size box squeeze-rolls.

Inasmuch as laboratory slashings had shown that a size mixture containing 6 per cent of Hycar 1561 solids was satisfactory, the first mill trials were run with 6 per cent size baths. However, roll settings, which were estimated to allow for 100 per cent pickup, left the yarn in a very wet condition. The dry cans were not able to dry this yarn adequately, and a rapid buildup of rubber on the dry cans resulted. To overcome this difficulty the roll pressure was increased. Under these conditions it was possible to slash enough yarn for weaving into fabric. The results in Table V show that for Run 1 the pickup was 6.4 per cent, but, as explained above, the run was discontinued and no fabric was woven. Run 2 was more successful, although the pickup was only 2.8 per cent. The Walker Abrader result was 40 cycles and fabric made from this yarn had as much initial abrasion resistance as standard starch-sized fabric. After five launderings the abrasion resistance had gone up to 521 cycles. How-

TABLE V
RESULTS OF TESTS ON FABRIC AND WARP YARNS SLASHED WITH HYCAR 1561 AND WOVEN AT ALABAMA MILLS

		yarn		*fabric*		
				*abrasion cycles, (avg)***		
run no.	*total solids in size bath*	*total solids (%)*	*abrasion cycles (avg)**	*as received*	*after 5 launderings*	*slasher conditions*
control 1	0	...	18	...	...	(unsized yarn)
control 2	12% starch	10.0	52	432	245	1 rubber roll—1 wool roll—medium pressure
1	6% Hycar	6.4	...	...	...	2 rubber rolls—light pressure
2	6% Hycar	2.8	40	438	521	2 rubber rolls—medium pressure
3	10% Hycar	3.3	30	343	348	2 rubber rolls—medium pressure
4	16% Hycar	3.3	35	361	494	2 rubber rolls—medium pressure
5	20% Hycar	6.6	46	445	544	1 rubber roll—1 yarn wound roll—medium pressure
6	20% Hycar	7.3	48	332	504	1 rubber roll—1 yarn wound roll—high pressure
7	20% Hycar	11.6	54	321	499	same, plus 5% Santomerse in latex

* Average of 48 determinations.
** CS-10 Calibrase wheels—average of five determinations.

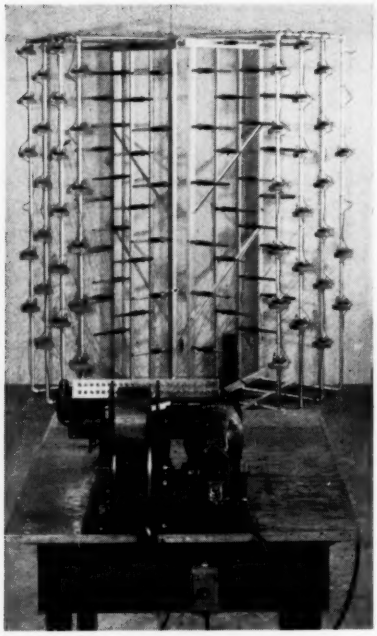

Figure 5
Yarn creel and beamer for winding slasher beams

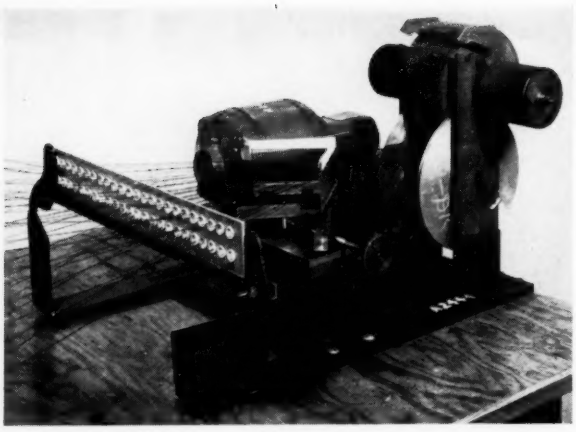

Figure 6
Beamer for winding slasher beams

ever, even this slasher run was beset with difficulties. After four beams had been run, the dry cans began to show evidence of a rubbery deposit. Therefore, for the next run the dry cans were cleaned and were coated with DeCetex 104. Inasmuch as the combination of 6 per cent of solids in the size bath and medium pressure with two rubber squeeze rolls had given a pick-up of only 2.8 per cent on the yarn, the next slashings were made with increasing amounts of Hycar solids in the size bath. Run 3 had 10 per cent solids in the size bath and gave a pickup of 3.3 per cent. However, the abrasion resistance of yarn and fabric was not as good as for Run 2. Run 4 had 16 per cent Hycar solids in the bath and also gave a pickup of 3.3 per cent. For this run the abrasion resistance of yarn and fabric appeared to be only slightly better than for Run 3.

At this point, it was decided that the yarn was not properly dressed as it left the size box. What was required was a yarn-wound roll, which is normally used in slashing with starch. Thus Runs 5, 6, and 7 were made with one rubber squeeze roll and one yarn-wound squeeze roll. Also, because the pickup from a 16 per cent Hycar size bath had been only 3.3 per cent in Run 4, Runs 5, 6, and 7 were made with 20 per cent Hycar size baths. From Table V it can be seen that the pickup for Run 5 was 6.6 per cent and the yarn abrasion value was 46. The fabric abrasion resistance value was 445 cycles initially and 544 cycles after five launderings. These are excellent values and are among the best that have been obtained with this process. In Run 6 the roll pressure was increased resulting in an increase of pickup by the yarn to 7.3 per cent. The effect of this increase is not noticeable in the yarn abrasion but it results in a lowered initial fabric abrasion resistance value. However, after five launderings the value was almost as good as for Run 5. In Run 7 the roll pressure was kept high and a wetting agent (5 per cent Santomerse) was added to the size. This resulted in a large increase in pickup by the yarn to 11.6 per cent of Hycar solids. The abrasion resistance of the yarn went up to 54 cycles, but again the initial abrasion resistance of the fabric was low ———321 cycles. After five launderings, however, the value went up to 499 cycles.

The results of these mill trials tended to confirm laboratory tests to the effect that the most desirable concentration of Hycar on warp yarn is about 6 per cent.

Although the runs reported in Table V solved several problems, they left one serious problem: the limited amount of yarn that could be run in one slashing. In each case, there was a very slight buildup of rubber on all rolls, although this was hardly noticeable at first. But by the time 4000 yards of yarn had been slashed, the buildup of rubber was quite obvious; it would peel off in non-uniform patches and become attached to the yarn. In some cases this prevented the yarns from splitting properly, and in others, these patches of rubber became attached to the dry can causing the yarn to stick. When pulled away from the dry can, the yarn would be delivered to the beam in a fuzzy condition.

It was observed that the deposit of rubber on the squeeze rolls was caused by the drying of the Hycar. This was especially noticeable during the doffing of full beams. To offset this effect, a system of water-spray nozzles was placed over the squeeze rolls in the size box. By maintaining a fine spray it was possible to run with less buildup of rubber on the rolls; however, the moisture, in time, caused a dilution of the size bath that was undesirable. Therefore, a material was sought which might be added to the size bath to retard the drying of Hycar size in thin films on the squeeze rolls. Softeners and humectants were the most obvious candidates. Although five different materials gave good abrasion resistance on the yarn, only Polyethylene Glycol 200 gave trouble-free runs. (Table VI shows the results of a mill trial using Polyethylene Glycol 200 to the extent of 5 per cent of the Hycar solids in the size bath. When Polyethylene Glycol 200 is added to the size there is an increase in pickup.) In later runs the solids content of the size bath was reduced to 15 per cent, resulting in a pickup of 6.6 per cent. It appears that Polyethylene Glycol 200 retarded the buildup of rubber on the squeeze rolls, while improving the abrasion resistance of the yarn. Table VII shows the results of a Taber Abraser on several different types of denim fabrics sized with Hycar and Polyethylene Glycol 200 at Alabama Mills.

TABLE VI
RESULTS OF TESTS ON BLUE DENIM YARN SIZED WITH HYCAR 1561 AND POLYETHYLENE GLYCOL 200

beam no.	*Hycar solids (%)*	*abrasion cycles to failure of yarn (avg)*
1	9.6	71
2	9.0	78
3	8.2	64
4	10.4	69
5	10.3	67

Figure 7
Walker abrader showing Hycar-sized denim yarns being abraded

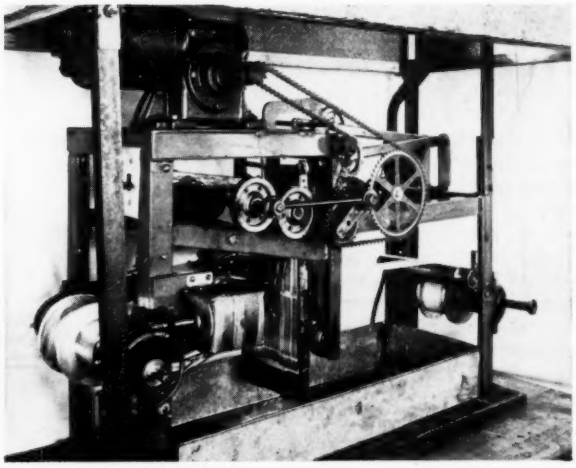

Figure 8
SRI shed tester, metal enclosure not shown

DISCUSSION

COLOR RETENTION ——— Ordinarily, blue denims must be washed separately lest they discolor other clothing. Their leaching in water and the easy crocking of the indigo present serious problems. Also when denims are ironed the indigo sublimes at fairly low heat and is transferred to other fabrics. To test the effect of Hycar 1561 on these properties, squares of bleached white sheeting were tacked on larger pieces of starch-sized blue denim and Hycar-sized blue denim. The samples were given modified ASTM No. 3 wash tests and after each the appearance of the wash water was noted. In every case, the water from the starch-sized fabric was milky blue while the water from the Hycar-sized fabric was clear. The thoroughly rinsed samples were ironed dry in two different ways. In one case, the white swatches were removed and were ironed separately. In the other, the white swatches were ironed in contact with the blue denim. In both methods of ironing, the white swatches were badly stained with blue in the case of the starch-sized blue denim, and the white swatches showed no transfer of color in the case of the Hycar-sized blue denims. This experiment was repeated with the same blue denim fabrics but new white swatches were tacked on before each laundering cycle. Even after the fifth wash the starch-sized fabric caused a staining of its attached white fabric.

MECHANISM OF ACTION ——— Marsh *(1)* has described a patent by Bongrand (B P 405,311 in which the alkalinity of Hevea rubber latex, having a pH of approximately 10 to 11.5, is compared with the slight acidity of cellulose. He suggests that when the acid fibers are brought into contact with the alkaline latex, a partial coagulation takes place at the point of contact with the formation of an almost invisible film, which is sufficient to prevent further penetration. This may well be the effect in the case of Hycar.

TABLE VII
RESULTS OF TESTS ON MILL-SIZED BLUE DENIM FABRIC WASHED IN LAUNDER-OMETER

Fabric designation	*Hycar 1561 on warp yarns (%)*	*Launder-Ometer Cycles* 0	1	2	3	4	5
		*wear cycles**					
D-CS	...	1501	1372	1078	944	905	889
D-H-1	8.0	1312	1404	1498	1591	1654	1791
D-H-2	9.8	1306	1388	1453	1547	1623	1809
SD-CS	...	831	722	685	597	554	538
SD-H-1	7.4	657	783	913	1019	1094	1167
SD-H-2	7.1	590	630	807	952	1047	1129
WB-CS	...	1775	1284	1273	1345	1276	1151
WB-H	9.2	1855	1945	2049	2123	2292	2407

* New Calibrase CS-10 wheels.
D = 8 oz blue denim.
SD = lightweight sport denim.
WB = 11 oz white back denim.
CS = commercial starch size.
H = Hycar size.

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(*2*) Abrams, E, *Textile World* 102, 132 (1952).
(*3*) Zwicker, B M G, *Ind Eng Chem* 44, 774, 1952.

APPENDIX

SLASHING ——— The size box of the laboratory slasher is made of stainless steel and is equipped with a perforated copper tube for the introduction of live steam. The delivery of steam is controlled by a recording thermostat which can be preset to give a wide range of size box temperatures. For the experiments reported here, the size box temperature was kept at room temperature.

In the size box are two stainless steel rolls with rubber-coated squeeze rolls above them. These rolls are driven by an electric motor through a Graham variable speed transmission. The yarns are fed into the slasher from four beams each containing 42 ends. The sheet of yarns as it enters the size bath, contains 168 ends lying side by side, as in standard mill practice. The wet yarn is carried through an electrically heated drying oven at 300° F and then the dried yarns are separated from each other by means of split bars. Finally, the sheet of sized yarns is collected on a 4" shed tester spool.

SHED TESTING ——— The SRI Shed Tester is essentially a miniature loom without the filling motion. It is equipped with a double set of harnesses, a reed, and drop-wires for automatic stop motion when yarns break. In operation, the reed is caused to strike an impact bar simulating the action of the reed on a standard loom. About 15 yards of sized warp yarns are

passed through the shed tester in each test during the space of about 4 hours. The fibers and size that are abraded from the yarn drop to the bottom and are collected in an enclosed pan. This material, called shed, is weighed and the result is expressed as percent of the weight of the weight of the total yarn tested. Previous results in this laboratory indicate that shed tests are reproducible to less than 0.1 per cent.

ABRASION RESISTANCE —— The abrasion of the yarn is measured on the Walker Abrader. This machine causes yarns to rub against each other until there is a break. The number of abrading cycles which is required to cause a break is recorded. In practice, 24 strands of a given sample of yarn are mounted on the Walker Abrader. As each yarn breaks, the machine stops and the number of cycles is read from a counter. After 12 consecutive breaks are recorded, the machine is stopped and the remaining 12 strands are discarded. Four sets of abrasion data are thus obtained for each yarn sample. The grand averages are the averages of all 48 determinations for each yarn sample.

All shed and abrasion resistance tests were made in a conditioned room controlled at 70° F and 65 per cent RH.

ABSTRACTS

Use of Chemicals in the Textile Industry

C F Fitton, *Canadian Textile J* 70, 53-7, March 13, 1953.

The author discussed the various aspects of water in its relation to dyeing. He pointed out that the amount of calcium and magnesium in a moderately hard water (50-150 parts per million) is equivalent to 5-15 lbs. of soap in a 500 gal vessel.

Following are some of the other components frequently found in mill waters: organic matter from decayed animal and vegetable material, which has a reducing action on some dyes; chlorine, added to the water to destroy disease germs, the disadvantage of which in a dye-bath is obvious; aluminum, used as a floc to remove turbidity and coloring matters, which has a precipitating action on soaps and some dyes; iron, either as soluble salts or from iron pipes, which will react with certain direct dyes, forming iron complexes; acidity from the carbon dioxide in the air, and alkalinity resulting from the softening process.

The water in the dye-bath may also be contaminated by foreign matter carried into the bath by the goods themselves; for example, lime soaps, left in the material if scoured in hard water prior to dyeing, also starches, gelatine, desizing agents, fats, waxes, etc. Many of these substances are either anionic or cationic. The anionic impurities may cause trouble with cationic dye fixatives, and the cationic impurities may react with fluorescent bleaching agents. In short, it is important to insure the compatibility of all products used together in the dyebath.

The most commonly used method of water-softening at present is the zeolite type, the so-called "base-exchange" method. This has the disadvantage that although it removes the calcium and magnesium salts, it substitutes an equal or increased amount of soluble salts.

A newer method of softening is that of "sequestration," in which the objectionable metal ions are inactivated by becoming chemically bound within the anion of the sequestrant. The most common sequestering agent is tertasodiumpyrophosphate. Here also the amount of soluble salts in the water is increased. Organic sequestrants are also being used to advantage.

Water softening by a new process of "deionization" is described at some length by the author. The water is passed successively through two filter beds, each containing a particular synthetic resin. The resin in the first filter combines with the metallic ions in the water being treated, leaving an equivalent of acid in solution. This is absorbed by the resin in the second filter, and the filtrate emerges, freed from calcium and magnesium salts and without the addition of by-products.—WHC.

The Transfer of Disperse and Water-Soluble Dyes to Cellulose Acetate During Steaming

E H Daruwalla and H A Turner, *J Soc Dyers Colourists* 69, 240-53, July, 1953.

The authors investigated the transfer of printed acetate dyes, both disperse and soluble, to the acetate fiber during steaming, and the effects, on this transfer, of the concentration, chemical structure, and particle size of the dye, and of the presence of electrolytes and swelling agents. Following is a summary of some of the principal results recorded:

1. When a film of cellulose acetate, of a composition identical with that used for the manufacture of norman acetate rayon, is maintained in steam for a short period it becomes delustered. A similar film steamed in contact with a film of starch retains its transparency for several hours, showing that the starch has markedly diminished the ability of the cellulose acetate to retain the moisture taken up from the steam.

2. The general characteristics of the transfer of disperse and soluble acetate dyes from starch to cellulose acetate in printing are, respectively, closely similar to those of their transfer from water to the acetate rayon during dyeing.

3. The exhaustion of the disperse dyes from the thickener to the cellulose acetate at equilibrium is high, being of the order of 90 per cent in the dyes examined. For a given dye it is independent, over a wide range, of the initial concentration of dye in the thickener layer. The higher the initial concentration of dye in the thickener, the longer is the time required to reach equilibrium conditions.

4. Reduction in the particle size of the dye increased the rate of transfer to the acetate fiber.

5. Addition of a neutral electrolyte had no effect on the single disperse dye tested.

6. Where possible, each of the soluble acetate dyes investigated was chosen to be a derivative (sodium sulfuric ester) of a disperse dye the transfer properties of which had also been studied. The exhaustion of the soluble dye during the whole course of steaming was less than that of the corresponding disperse dye, and in no case had definite equilibrium conditions been established at the end of 8 hours steaming.

7. The transfer of soluble dyes to the cellulose acetate was, in general, increased by the addition of neutral electrolyte to the printing paste, the specific increase being different for different dyes.

8. Each disperse dye and its corresponding soluble derivative were destroyed during steaming when sodium alginate was used as a thickener, the soluble form being the more rapidly decolorized.

9. Among the swelling agents tested, sodium thiocyanate, once sufficient water was obtained from the steam, caused an unusually rapid and large migration of dye

to the fiber. Diethylene glycol assisted migration during the drying process, but evaporated during the steaming.—WHC.

Photographic Prints

M Siegel, *Modern Textiles* 34, 58-9, August, 1953.

In the making of photographic patterns, from 5 to 12 rolls are used for each, as one roll must be used for each color desired.

To engrave such a roll, a full-size painting, drawing, series of photographs or paintings, or just the suggestion of an idea, is supplied to the engraver. The picture is photographed on film to the exact size of the roll to be used, as either a line or half-tone positive. Since one roll is used for each color, a separate positive is required for each roll, as these will all differ slightly.

A sensitizer is applied to the roll, of which there are many commercial types. The positive (film) is brought in contact with the roll, exposed by means of an arc light, and developed in water in subdued light.

The unexposed portion of the sensitizer on the roll is soluble in water, and so is dissolved. Everything that is not hardened by the light is washed away. Since most sensitizers are transparent (colorless), only a very faint image can be seen. To make this image clearly visible, the sensitizer remaining on the roll is then dyed with a dye such as methyl violet. The roll is then air-dried and baked, and the exposed sensitizer remaining on it becomes acid-resistant. It is then touched up by hand with asphaltum varnish, to reinforce the acid-resistant surface.

The roll is then dried and immersed in iron perchloride for etching. After it is etched to a certain depth, it is returned to the artist to protect certain areas with asphaltum, to prevent any further etching at these areas. The roll is then re-etched until a final depth from 0.0005" to 0.006" is attained depending on the fabric to be printed. It is then washed, and a trial print made. Any misses or defects are now corrected by hand engraving.

The process described above is said to be employed at the Multitone Engraving Co, Inc, Rochelle Park, N J.—WHC.

Aminization of Cotton

W A Reeves and J D Guthrie, *Textile Research J* 23, 522-7, August, 1953.

A few years ago it was reported by one of the present authors that amino groups could be attached to the cellulose of cotton by reacting it with 2-aminoethylsulfuric acid in the presence of sodium hydroxide. A degree of aminization represented by 0.3-0.4 per cent of nitrogen may be readily obtained by this method.

The present paper reports work that has been done to find ways for applying the aminization process to cotton in various forms, and to increase the degree of aminization that can be obtained by a single processing.

Methods are described for the aminization of cotton in the form of raw stock, sliver, yarn, and fabric by curing with 2-aminoethylsulfuric acid in the presence of sodium hydroxide. Fabric may be conveniently aminized in a practical manner using standard cotton chemical finishing equipment. Sliver aminized by the process described may be opened, recarded, and converted into yarn. Experiments dealing with the effect of various processing conditions on the aminization of sliver are reported. It is shown that 30-35 per cent sodium hydroxide solutions usually give a higher degree of aminization than a 25 per cent solution, and that a 20 per cent solution of 2-aminoethylsulfuric acid under the proper conditions will give almost twice the degree of aminization obtained with a 10 per cent solution.

The authors also report experiments with a number of other compounds related to 2-aminoethylsulfuric acid (e g, 2-sulfatoethyl dimethylamine), and with two other methods of aminization, patented by I G.—WHC.

Chemical and Physical Properties of Aminized Cotton

W A Reeves, O J McMillan, and J D Guthrie, *Textile Research J* 23, 527-32, August, 1953.

The chemical reactions of aminized cotton are quite different from those of untreated cotton. Aminized cotton takes on most cotton dyes very rapidly, and some of these, especially direct dyes, are more resistant to light and laundering on aminized than on untreated cotton. Although acid dyes are readily taken by aminized cotton, they are not fast to laundering. Combustibility of aminized cotton can be reduced either by application of dyes containing a phosphate or a sulfo radical or by reacting the amino groups with tetrakis (hydroxymethyl) phosphonium chloride. Certain metals (e g, copper and nickel) react with the amino groups to form metal complexes which have oxygen-exchange properties. Aminized fabric can be given considerable rot-resistance by reacting with 8-hydroxyquinoline-5-sulfonic acid and then chelating with copper. Aminized cotton reacts with ortho- and paranitrochlorobenzenes in dilute solutions.

The physical properties of moderately aminized cotton (0.3-0.8 per cent of nitrogen) are not very different from those of ordinary cotton. Generally a slight stiffness is its most pronounced physical feature. This property is increasingly more pronounced as the degree of aminization increases. Aminized fabric (0.67 per cent of nitrogen) had a cuprammonium fluidity of 15.4 rhes, whereas the fluidity of a sodium hydroxide-treated control fabric was 11.4 rhes and that of an untreated control fabric was 2.94 rhes. Tear strength and breaking strength are about the same as that of ordinary cotton, but aminized cotton fabrics have noticeably better abrasion-resistance. Aminized fabric is more easily soiled and retains the soil more tenaciously than control cotton.—WHC.

Man-made Fiber Production

Anon, *British Rayon & Silk J* 30, 41, August, 1953.

The present production potential in the world for all the man-made fibers is estimated at 5,622,000,000 lbs. This is divided into 4,367,000,000 lbs of viscose, 789,000,000 lbs of acetate, and 466,000,000 lbs of noncellulosic fibers. By the end of 1954 the world capacity figure is expected to advance to 6,408,000,000 lbs, an increase of 14 per cent over present potential. In analysis the comparative increases will be as follows: viscose filament (ordinary) 6 per cent, high tenacity 10 per cent, acetate filament 5 per cent, viscose staple 11 per cent, acetate staple 14 per cent, and for the synthetics 68 per cent. Practically all countries are planning substantial increases in rayon production and the estimated total world potential at the end of next year is 5,624,000,000 lbs.

The production of synthetics and other noncellulosic man-made fibers has developed more slowly elsewhere than in the U S, but large increases in capacity are now under construction in a number of countries, notably Britain, France, Western Germany, Spain, and Japan. Even so, the U S will also be expanding rapidly and will still account for about three-quarters of the grand total of these fibers.

There are 37 countries producing filament yarn, all of them using the viscose process and 18 also producing acetate. There are 33 national producers of rayon staple, all of them producing viscose and 11 also producing acetate staple. Five countries are listed as producers of cuprammonium filament yarn, although the cessation of the British plant will reduce the number to four: Italy, Western Germany, the U S, and Japan. The first three also produce cuprammonium staple.—WHC.

The Control of Azoic Dyeing Processes

E R Wiltshire, *Dyer* 110, 181, August 7, 1953.

In an introductory discussion of Brenthol (Naphthol) substantivity, the speaker emphasized that the Brenthol is the basis of the shade—if it is not applied properly and in the correct quantity, the final shade will not be right—and stated that the depth of shade is determined by the amount of Brenthol absorbed on the fiber.

He pointed out that the sodium salt of the Brenthol (the active principle involved) is relatively unstable and easily hydrolyzed back to the parent Brenthol (a weak acid) by the action, e g, of carbon dioxide, and of course most easily by the action of acids. Such hydrolysis is dangerous for the dyer, because the parent Brenthol is an inert substance and will not couple. The diazo solution is even more unstable, and unfortunately its requirements for the moderate stability that it does possess are the exact opposite of those of the Brenthol salt. Alkali converts the active diazo compound to an anti-diazotate that will not couple.

Illustrating the coupling reaction, which can be speeded up or slowed down, the speaker continued: "Which way do we want it to go? To answer this question we must return to our reactants: the Brenthol sodium salt and the diazo compound. The former is only stable in alkali, the latter in acid. Under what conditions should they meet? Obviously around the neutral point (pH 7); but this is easier said than done, especially when we are laboriously dropping 100 lbs yarn into an open beck, or passing several hundred yards of Brentholated cloth through a small developing bath in a jig. Consequently, a high speed of coupling is essential—there is less time for anything to go wrong—for the Brenthol sodium salt to hydrolyze or for the diazo compound to change."

To avoid uneven developing, a generous excess of developer over that required on the basis of the chemical equation is always used, particularly in long liquors.

Unfortunately it is not possible in practice merely to set the developing bath in a neutral condition and leave it at that, because the Brentholated fabric is alkaline and will immediately turn the diazo solution alkaline. A nicely calculated addition of an "alkali-binding agent" is necessary to ensure that while the diazo compound is kept stable by being maintained slightly acid, yet the final conditions for coupling are approximately neutral. The agents most commonly used are acetic acid or aluminum sulfate; or zinc or magnesium sulfate, where only very slight acidity is permissible. Strong acidity must be avoided.

In package dyeing, the addition of sodium acetate to the developing bath, acting as a "buffer," will prevent hydrolysis of the Brenthol sodium salt.—WHC.

A Study of the Afterchrome Process

J F Gaunt, *Textile Mfr* 79, 436-7, August, 1953.

The author emphasizes that the weight of wool dyed, and particularly the weight of dyestuff used, by the afterchrome process is far greater than the corresponding figure for metachrome dyeing. He points out that in the case of wool, afterchrome dyeing is the only method by which full advantage can be taken of the excellent level-dyeing and migrating properties of many chrome colors. The dyestuff can be applied evenly in a similar way to a level-dyeing acid color, and then converted very simply into a much more complicated molecule of high wet fastness. It is generally accepted in the wool trade that less damage is done to wool by dyeing from a slightly acid bath than from more strongly acid or alkaline liquors.

By the afterchrome process, good exhaustion of the dyebath, even of full shades, can be achieved without difficulty by proper pH control, and it is usually much cheaper than other chrome processes. It is mainly used on loose wool and slubbing, but is also of importance for piece goods and to a lesser extent for yarn, according to the author.

Although the afterchrome colors are generally similar in dyeing properties to level-dyeing acid colors and the less fast members of the acid milling colors, he cautioned that several of the more common afterchrome colors are converted into very fine dispersions, presumably of the free acid, by addition of relatively small amounts of acid.

He summarized the effect of boiling solutions of bichromate on wool as follows: (a) the chromium is first taken up as chromic acid, by salt formation with basic groups of the wool, (b) the chromic acid is then reduced by the wool to the trivalent state. This leads to a rise in the pH of the liquor, since the strongly acid chromic acid anion is reduced to neutral trivalent chromium, and to maintain electrical neutrality the chromic acid anions are replaced by hydroxyl anions formed by hydrolysis of the water in the liquor.

The rate of absorption of chrome by wool is governed to a great extent by the pH of the liquor, not only at the commencement of chroming but also during the chroming operation itself.

The author recommends that a minimum of 20 per cent of bichrome (on the weight of dyestuff) be employed, in order to ensure fixation of at least 12-15 per cent of the chrome. He added that the danger of uneven chroming is greatest in the case of strongly acid baths.—WHC.

Textured Yarn

D F Holmes, *Textile Mercury & Argus* 129, 202-3, July 31, 1953.

(Presented at a meeting of AATT)

This is a new process developed by du Pont's Textile Fibers Department, with the object of "converting normal yarns into unusual yarns, possessing striking surface textures."

Basically, a textured continuous filament yarn is characterized by the fact that it contains many tiny loops in the individual filaments, with only a few of the filaments in the yarn looped at any one point. Between each loop of any single filament, there are relatively long straight sections, so that both ends of the loops are anchored into the yarn by adjoining filaments. The characteristics of the yarn then would depend upon the following variables: the choice of the basic yarn, the number of filaments and size of filaments, the number of loops and size of the loops, and the amount of twist added to the yarn.

The tenacity of a textured yarn will be somewhat lower than the basic continuous filament yarn, but higher than a spun yarn of equal denier. The residual shrinkage of a stable textured yarn is essentially the same as that of the continuous filament yarn from which it is made.

It has been found that fabric made from textured yarns have much higher bulk and coverage than standard yarns. The luster is intermediate between continuous filament and spun fabrics. The handle is much drier and warmer than corresponding continuous filament fabrics, and generally crisper than spun yarn fabrics. Crispness can be varied, however, by change in loop size or in filament denier. Shortening the loops and increasing the denier per filament will accentuate crispness. Longer loops and lower filament denier will lead to softer fabrics with a more pronounced nap.

The author describes several experimental fabrics made from textured yarns composed of nylon, Dacron, and Orlon, respectively.

Some work has also been done in using these textured yarns in knitted fabrics. In tricot knitting, the increased covering power and change of hand is expected to provide broader application for tricot fabrics in lingerie, blouses, dresses, and other items. Men's socks from a lightweight lisle-type to heavyweight athletic socks have been prepared.

The author emphasizes that designing of the yarn itself, as well as of the fabric, will become important for a particular end-use. Changes in yarn characteristics will permit each mill to impart its own individuality to its fabrics.—WHC.

Proceedings of the
American Association of Textile Chemists and Colorists

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Editor of Proceedings: Carl Z Draves, 30 Lahey St, New Hyde Park, N Y

NOVEMBER 23, 1953

Philadelphia Section Meeting Reports

September 11, 1953

The Philadelphia Section met on September 11, 1953, at the Penn-Sheraton Hotel in Philadelphia with approximately 220 members and guests present to hear three papers on "The Dyeing, Backsizing and Soilability of Carpets and Rugs."

Chairman H L Morgan introduced Program Chairman J A Woodruff, who in turn introduced the following speakers:

Harry F Clapham, E I du Pont de Nemours & Co, Inc, "Dyeing of Wool, Wool Blends and Synthetic Fibers."

Onslow B Hager, Alco Oil and Chemical Corp, "The Backsizing of Carpets and Rugs."

K L Whitney, American Viscose Corp, "Carpet Fiber Soiling."

A special feature of the evening included exhibits of various types of carpets and rugs by manufacturers in the Philadelphia section. The exhibit also included photographs of various processing equipment for this work.

R B Stehle, Chairman of the Nominating Committee, submitted the following nominations for 1954:

Chairman — F V Traut — Globe Dye Works Co.

Vice Chairman—T H Hart—Hart Products Corp.

Treasurer—P Theel—Philadelphia Textile Institute.

Secretary—T J Scanlon—Dexter Chemical Corp.

Sectional Committee—F J De Maria, M J Reider, H J Rotters, R A Shimp.

Councilors—C T Anderson, E C Diehl, H L Morgan, A E Raimo, E A Rettberg, Jr, J A Woodruff.

October 23, 1953

THE Philadelphia Section met for the second meeting of the '53-'54 season on October 23, 1953 at the Penn-Sheraton Hotel in Philadelphia.

Approximately 150 members and guests were present to hear Henry E Millson, Calco Chemical Division, American Cyanamid Co, speak on "Microscopical Dyeing Phenomena: Studies with the Microdyescope." A question and answer period followed Mr Millson's talk.

Respectfully submitted,
THOMAS J SCANLON, *Secretary.*

CALENDAR

AATCC

COUNCIL
1954—Jan 22, Apr 30, June 15, Sept 15, Nov 19.
1955—Jan 21, Apr 15, June 17

NATIONAL CONVENTIONS
Sept 15-18, 1954 (Atlanta Biltmore, Atlanta, Ga); Sept 21-23, 1955 (Chalfonte-Haddon Hall, Atlantic City, N J).

HUDSON-MOHAWK SECTION
Dec 4, Jan 22 (Albany); March 5; April 9, May 14 (Albany); June 18 (Outing).

MID-WEST SECTION
February 13 (Hotel Bismarck, Chicago, Ill).

NEW YORK SECTION
Jan 29, Feb 26 (Hotel Statler, N Y); April 23, May 21 (Swiss Chalet).

NORTHERN NEW ENGLAND SECTION
Dec 4 (Lowell Technological Institute, Lowell, Mass).

PACIFIC SOUTHWEST SECTION
Jan 29.

PIEDMONT SECTION
Jan 30 (Hotel Poinsette, Greenville, S C); Apr 10 (Hotel Roanoke, Roanoke, Va); June 11-12 (Outing, Mayview Manor, Blowing Rock, N C); Sept 11 (Hotel Barringer, Charlotte, N C).

PHILADELPHIA SECTION
Dec 4, Jan 15.

RHODE ISLAND SECTION
Dec 4 (Annual Meeting, Sheraton-Biltmore, Providence).

SOUTH CENTRAL SECTION
Dec 5 (Patten Hotel).

WESTERN NEW ENGLAND SECTION
Dec 11 (Rapp's Restaurant, Shelton, Conn).

OTHER EVENTS

AMERICAN ASSOCIATION OF TEXTILE TECHNOLOGY, INC
Dec 2 (Builder's Club, New York, N Y).

AMERICAN CHEMICAL SOCIETY
National Chemical Exposition—Oct 12-15, 1954, Chicago, Ill.

AMERICAN SOCIETY FOR QUALITY CONTROL
Meeting of the Carolinas Section—Feb 4-6, N C State College School of Textiles, Raleigh, N C.

AMERICAN TEXTILE MACHINERY ASSOCIATION
Exhibit of American Textile Machinery, April 26-May 1, Atlantic City Exhibition Hall, Atlantic City, N J.

CANADIAN ASSOCIATION OF TEXTILE COLOURISTS AND CHEMISTS
Meetings of the Quebec Section—Dec 12, Jan 16, Feb 20, Mar 20, April 23-24 (McGill University, Montreal, Que); June 19 (Annual Outing).

DRYSALTERS CLUB OF NEW ENGLAND
Jan 18, April 30 (Hotel Vendome, Boston); June 25 (Annual Outing, Andover Country Club).

EXPOSITION OF CHEMICAL INDUSTRIES
Nov 30-Dec 5, Commercial Museum and Convention Hall, Philadelphia, Pa.

THE FIBER SOCIETY
Spring Meeting—May 5-6, Monticello Hotel and Thomas Jefferson Inn, Charlottesville, Va.

GARMENT DYERS GUILD OF AMERICA
Technical and business meeting—Dec 5. Netherlands Plaza, Cincinnati, O.

LOWELL TECHNOLOGICAL INSTITUTE ALUMNI ASSOCIATION
Annual Meeting—April 28 (Haddon Hall, Atlantic City, N J).

NATIONAL COTTON COUNCIL OF AMERICA
Annual Meeting—Feb 1-2, Atlanta, Ga.
Cotton Research Clinic—Feb 25-27, The Carolina, Pinehurst, N C.

NATIONAL INSTITUTE OF DRYCLEANING
45th Annual Convention—Feb 11-14 (Washington, D C).

NEW YORK BOARD OF TRADE (DCAT)
28th Annual Dinner, March 4 (Waldorf-Astoria, New York, N Y).

PHI PSI FRATERNITY
51st Annual Convention, Feb 25-27 (The Carolina, Pinehurst, N C).

PHILADELPHIA TEXTILE INSTITUTE ALUMNI ASSOCIATION
Annual mid-winter banquet and reunion—Feb 5 (Warwick Hotel, Philadelphia, Pa).

PLANT MAINTENANCE & ENGINEERING CONFERENCE AND EXHIBIT
Jan 25-28 (Hotel Conrad Hilton, Chicago, Ill.

SOCIETY OF CHEMICAL INDUSTRY
Meeting of the American Section—Jan 15 (Waldorf-Astoria, New York, N Y).
Plastics and Polymers Group Meeting—March 24-26, Institution of Electrical Engineers, Savoy Place, London, England.

SOCIETY OF THE PLASTICS INDUSTRY
Meeting of the Sheeting and Coated Fabrics Division—Dec 3-4, Commodore Hotel, New York, N Y.

SOUTHERN MUNICIPAL AND INDUSTRIAL WASTE CONFERENCE
3rd Conference—Mar 18-19 (North Carolina State College, Raleigh, N C).

SOUTHERN TEXTILE EXPOSITION
October 4-9, 1954 (Textile Hall, Greenville, S C).

TEXTILE TECHNICAL FEDERATION OF CANADA
Exhibit—April, 1955, Show Mart, Montreal.

Membership Applications

November 6, 1953

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"THE APPLICATION OF VAT DYES"

Monograph No 2

American Association of Textile Chemists and Colorists

MONOGRAPH NO 2, dealing with "The Application of Vat Dyes" has been prepared by a Board of Editors and Collaborators in the American Association of Textile Chemists and Colorists. This group represents a complete cross-section of the entire industry so that the text of the Monograph represents latest information both from laboratory and practical plant standpoints.

The Monograph contains approximately 385 pages with contents of various chapters as follows:

I *HISTORY*—Natural Indigo and Tyrian Purple; Development of Synthetic Vat Dyestuffs; History of Application of Vat Dyes; The Application of Vat Dyes to Fibers Other Than Cotton.

II *PRINCIPLES OF VAT DYE APPLICATION*—Types and Forms of Vat Dyes in Commerce; Chemistry of Application; Stripping and Redyeing Faulty Vat Dyeings; Fastness; Print Discharges; Change of Shade in Artificial Light; Dichroic Dyes.

III *APPLICATION TO COTTON RAW STOCK*—Equipment Used; Methods of Color Application; Typical Examples.

IV *APPLICATION TO COTTON SKEINS*—Equipment and Methods.

V *APPLICATION TO COTTON WARPS*—Short Chain Method; Long Chain Warp Dyeing; Continuous Pigment Padding Method.

VI *APPLICATION TO COTTON PACKAGES*—The Package; Package Dyeing Machines; Chief Factors in Dyeing Packages with Vat Dyestuffs; Dyeing Speed and Levelling Power of Vat Dyes; Dyeing Methods; Oxidation and Finishing; Vat Dyeing on Beams; Illustrative Dyehouse Procedures.

VII *APPLICATION TO COTTON PIECE GOODS*—History; Jig Methods; Padding Methods; Continuous Methods; Overhead Reel Method; Vat Dyeing of Cotton Narrow Fabrics.

VIII *HOSIERY*—Application of Colors to Cotton Hosiery; Application of Colors to Mixed-Fiber Hosiery.

IX *APPLICATION TO FIBERS OTHER THAN COTTON*—Vat Dyeing of Viscose Rayon; Vat Dyeing of Cellulose Acetate; Vat Dyeing of Nylon; Vat Dyeing of Animal Fibers.

X *GENERAL PRINCIPLES OF PRINTING*—Piece Goods; Forms Other Than Piece Goods.

XI *PRINTING*—Direct Printing with Vat Dyestuffs; Discharge Printing with Vat Dyestuffs; Goods Dyed After Printing.

XII *INDIGO*—History and Properties; Various Indigo Vats and their Preparation; Dyeing of Cotton with Indigo; Dyeing of Wool with Indigo; Application of Indigo to Cotton Printing; Indigo Derivatives.

XIII *THE USE OF VAT DYES AS PIGMENTS OR IN NONTEXTILE APPLICATIONS* — Paper; Rubber, Plastics and Resins; Fireworks; Paints and Lacquers; Resin-Bonded Pigments; Miscellaneous.

XIV *LEUCOESTERS OF VAT DYESTUFFS*—History and Chemistry; Properties; Application of Leucoesters; Light Fastness of Leucoesters; Relative Costs of Vat and Soluble Vat Dyeing.

XV *TABULATION OF VAT DYESTUFFS*—Formulae and Properties; Numerical Index; Alphabetical Index; Trade Names of American-Made Vat Dyes.

AUTHOR INDEX
SUBJECT INDEX

From the foregoing, it is seen that this Monograph gives a very comprehensive description of all of the factors involved in the application of vat dyes. In all discussions of application procedure, practical working formulas are given. This publication is, undoubtedly, of interest to all persons who are either producers or consumers of vat dyes.

The price of "The Application of Vat Dyes" is $5 per copy, postpaid, to members; to nonmembers it is $6 per copy. Please use the order form at the bottom of this page.

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1953 Annual Convention
Cotton Group——

COTTON——AN OLD FIBER WITH A NEW FUTURE*

LEONARD SMITH
National Cotton Council of America

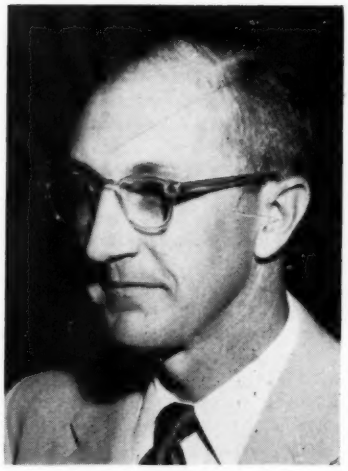
INTRODUCTION

OUR principal objectives in this paper are to recall to your minds some of the developments that have taken place in cotton technology in the immediate past and to bring to your attention the inevitable conclusion of these developments, namely, that cotton's future is certain to be very different from its past.

Because of limited understanding, there has been a mistaken concept about fibers that says, "Cotton is a good old staple fiber that wears well, launders well, feels good, and is cheap; but, unfortunately, it grows out of plants; we have to take it as it comes, accept it as it is; there is nothing we can do to make it any different. On the other hand, the chemical fibers are the product of the laboratory. They can be controlled at every stage of their production, their properties can be varied at will and adapted or tailor-made to any given requirement." The one view is as extreme as the other, and as incorrect.

COTTON VERSUS CHEMICAL FIBERS——If we compare the natural and chemical fibers, we must certainly agree that they are different. Each has unique features not duplicated in the other. Cotton doesn't have the elasticity of nylon or the bright luster of rayon, but it does have high absorbing power, wet strength and a crisp hand. The synthetic fibers are extruded in continuous filaments. The cotton producers have not yet learned how to make the cottonseed sprout a continuous monofilament that will wind around it like silk around a silkworm, but neither have the chemical fiber producers succeeded in reproducing the biologically formed fine structure that gives cotton some of its great advantages.

Producers of synthetic fibers admittedly are attempting to duplicate some of the fine qualities of cotton, its moisture absorptivity, its launderability, its relative freedom from static. By the same token, the cotton industry is trying to learn how to modify cotton to produce some of the qualities of the synthetics that are desirable in particular applications: their speed of drying, loftiness, and luster.



L Smith

Cotton, long considered an unchanging and unchangeable textile fiber, is becoming a new, different and more useful textile raw material.

Through breeding research in recent years, it has improved in length and strength, and different fiber diameters are available. By physical treatment, it is now possible to produce cotton of increased luster, of greater or lesser crystallinity at will. The importance of these changes, in terms of yarn and fabric performance and in terms of response to chemical treatment, is receiving further study. A polyhydric alcohol, cotton reacts chemically to yield fibers of startlingly different characteristics. The esters and ethers which it forms are proving valuable in many diverse uses. Because of its excellent bonding properties, cotton responds to treatment with a wide variety of finishes and coatings which make it more serviceable in specific markets.

The versatility of cotton has long been recognized. Research is now converting cotton into specialty fibers designed to give ultimate performance in particular uses.

Let us recognize that various textile uses demand many different qualities, and that producers of all fibers are attempting to make their product satisfy the requirements of as many of these uses as possible. The reason is very clear. Despite any published or expressed views that say otherwise, the competition for markets is keen and will continue to be.

HISTORICAL PROGRESS OF COTTON

Cotton technology has moved along at a more rapid rate than is generally realized. Unless you have been intimately concerned with cotton, it is not likely that you appreciate fully how significant are the changes that have been brought about since just before World War II.

In the ten-year period, 1941 to 1951, the national average strength of cotton fibers has increased 6.7%. In some large producing areas the strength increase has been as much as 25%. Fiber length has gained 6%. Meanwhile, yields per acre have been climbing — 16 lb of lint cotton more per acre in the 1947-51 period than in the previous 5 years. Tremendous strides in mechanization of cotton production are doing much to make cotton a tougher competitor pricewise. In the Mississippi Delta, for example, research has shown how to cut labor requirements from the 140 man hours per acre required with men and mules to less than 30 hours under full mechanization. And mechanization is increasing yearly. Only five years ago less than 1% of the cotton crop was machine harvested; last year about 16% of the crop was harvested mechanically. This year we expect to have enough machines to harvest 30%. In the use of the fiber, chemically modified cottons are more satisfactory for some uses, and the surface of cotton chemistry has only been scratched compared with all that remains to be explored.

COTTON GROWING——Let's take a brief look at some of the promising technological developments of the past that foretell a brighter future for cotton in world textile markets.

First, the cotton breeders may well make available to us in a few years cottons that are far superior to any we have seen. There are now in the experimental breeding blocks new strains with strengths of 125,000 to 135,000 lb per sq in. This compares with today's varieties having strengths of about 80,000 to 85,000 lb, which, as we have pointed out, is a substantial increase over the 65,000 to 70,000 lb commonly realized ten years ago.

Of course, it takes time to breed high

* Presented in the South Ballroom of the Conrad Hilton Hotel in Chicago on Friday afternoon, September 18, 1953.

strength and other desirable properties into cotton, but the cotton industry has established a way to cut this time by at least a third. Seeds from the US summer crop are planted at a winter plant breeding station in Mexico and harvested in time to plant the next generation in the US. Thus, an extra crop each year is realized, and the characters being bred into the new strains are fixed more rapidly. The breeders are developing higher-yielding cottons, with greater resistance to disease and insects, and with agronomic characteristics that especially adapt them to mechanization.

Real progress has been made in developing improved defoliants and chemicals for weed and insect control. An agronomic revolution is taking place in the South, with submarginal land being converted to pastures, and crops being grown on the most productive acres. Improved cultural practices, scientifically developed and proven, are coming into more widespread use with the inevitable result that production quality will improve and costs will be lowered.

CHEMICAL MODIFICATION AND FINISHING———You are more likely to be aware of the progress that has been made in the chemical modification and finishing of cotton. Crease-proofing, permanent embossed effects and glazed finishes have done much for cotton in apparel and household uses. This is proved in the ultimate test of all — the marketplace. Between 1951 and 1952 there was a substantial increase in total manufacture of women's dresses, skirts, blouses and suits, and of men's sports shirts and dress and sport trousers. If cotton had achieved in these markets the same percentage increase as did all other fibers, the total increase in cotton consumption would have been 36,000 bales (18,000,000 pounds). But in these markets cotton consumption increased 76,000 bales (38,000,000 pounds). In other words, cotton had a clear-cut competitive gain of 40,000 bales (20,000,000 pounds), a gain which reflects improved product performance and smart promotion of those new products.

In industrial uses, partially acetylated cotton offers some promise of regaining a large share of a market that other fibers had been invading. The laundry trade annually consumes about 30,000 bales (15,000,000 pounds) of cotton in such items as flatwork ironer covers, press paddings, and so on. This is about half the total market, all of which was formerly supplied by cotton. Cotton's competitors are more expensive, but by giving longer service they have had a price advantage in actual service. Acetylated cotton has a better price performance ratio than the competitors, and it is reported by laundry owners to put a higher-quality finish on the work. We think that acetylated cotton may also find use in electrical insulation because of its improved resistance to heat and mildew and because of its improved electrical properties.

Other treatments, as those to impart flame resistance, water repellency and shrink resistance, have found extensive use.

Clearly, the cotton industry has been making progress; but the rate of progress needs to be greatly accelerated, and we think that it definitely will be.

FUTURE PROGRESS OF COTTON

Now let us take a look at this new future we foresee for cotton.

There are, of course, two ways to do cotton research. One may set a desired objective and then devise experiments that are likely to achieve some improvement in that direction. This has already been done in such developments as the US Department of Agriculture's THPC flameproofing treatment, in acetylated cotton for mildewproofness, in water-repellent finishes. On the other hand, one can make a variety of chemical changes and evaluate the products carefully to determine how they might be used. The heat resistance of acetylated cotton grew from just that type of evaluation. We believe that cotton needs a lot more of the latter type of exploratory basic research.

Although there can be no sharp definition, for discussion we will talk about (1) physical and (2) chemical changes in cotton fibers, yarns and fabrics. In all of our work on cotton modification we hold fast to one basic principle: we want to retain the unique advantages we already possess in the fiber. Therefore, all of the changes we make in cotton should be made without destroying the fibrous character of our basic material.

FUTURE PHYSICAL MODIFICATION OF COTTON———In the group of physical changes desired, we might wish to effect a change in the crystalline arrangement of the cellulose molecules in the fiber. Cotton's high crystallinity makes for strength, but it also makes for stiffness and a lack of extensibility. Reducing the percentage of crystalline cellulose results in a fiber with greater extensibility. In changing the crystallinity, we certainly do not want to shorten the molecular chain length, for this is one of cotton's unique and real advantages. We want to change the arrangement of the molecules so as to have a fiber that has greater chemical receptivity and reactivity and different physical characteristics.

By making the cotton fiber more amorphous, we should be able to improve cotton crease-proofing treatments. Introduction of cross-links normally reduces the extensibility of the fiber and decreases tear strength; but, by making cotton more amorphous before treatment, we might achieve an increase in the tear strength of the treated product. Moreover, if we could achieve a more open molecular structure, it might be possible to introduce longer bridges or cross-links than those achieved with currently used treatments.

There are several other objectives sought in making physical changes in cotton fibers. Increasing elongation would bring more of the individual fibers into stress as the yarn is stressed, thus increasing yarn strength. Increased strength might also be attained by changing the surface contours to establish more intimate interfiber contact or by increasing the interfiber cohesion, either by changing frictional characteristics or by some other technique.

Still another objective sought through physical change would be increased luster of cotton yarns and fabrics. The fiber markets in which luster is a desired quality are large. Even at a cost increase of 10¢ per sq yd of fabric and 10¢ per lb of yarn, there exists a potential market of about 2 billion sq yds and 300 million lb.

Experiments along several lines have demonstrated the possibility of achieving substantial changes in the physical make-up of the cotton fibers. If cotton is treated with ethylamine, and the ethylamine is subsequently removed by evaporation or solvent exchange, the crystallinity of the cotton is reduced from about 90% to about 25%. Upon immersion in water the crystallinity goes back up to about 45%. These fibers have a 10 to 20% larger cross section. The increase in moisture-absorbing capacity that results indicates that decrystallized cotton should be more responsive to chemical treatment. Work at the Southern Regional Research Laboratory is currently being directed toward finding out just what the effect of such a pretreatment may be on a number of subsequent treatments. One exploration has to do with the effectiveness of urea-formaldehyde or melamine-formaldehyde treatment of decrystallized cotton. The product will absorb larger amounts of resin more quickly. The effect on crease resistance is still being evaluated.

Another series of experiments involves the mercerization of cotton as raw stock, followed by processing the mercerized fibers to determine what changes have been made. Frankly, spinning both decrystallized and mercerized cotton has been a tough problem. On last reports, however, the Southern Regional Research Laboratory had begun to make real progress in finding ways of processing them satisfactorily.

FUTURE CHEMICAL MODIFICATION OF COTTON———Now let us talk briefly about possible chemical changes in cotton fiber. Obviously, this subject is too broad to cover thoroughly, but we would like to point to a few examples as indicative of what might be tried. Let us think of cotton fiber as a high-molecular-weight, polyhydric alcohol, which undergoes the reactions of primary and secondary alcohols.

The chemistry of cellulose has been pretty thoroughly explored and is well understood. The application of cellulose chemistry to cotton fibers, however, has perhaps not been so thoroughly worked out. The reactions do not proceed so readily or so extensively. With limited research facilities, neither the textile industry nor the cotton producers has been able to do the careful, determined research that is needed. Certainly the field has not been exhausted, and it needs to be thoroughly explored to see what can be done to bring about desirable changes in cotton.

Cellulose, like other alcohols, will form esters with a variety of acids. Textile-wise, the esters of the inorganic acids are of little or no interest, except for special effects. One foreign textile finisher orders woven fabrics in which certain yarns consist of nitrated cotton. The fabric is printed with caustic and the caustic printed portions of the nitrated yarns are dissolved out. The remaining portions are denitrated. The resulting fabrics are unusual and strikingly beautiful because of their fine, intricate, lace-like appearance.

Esterification with organic acids has been used to form a variety of products, of which partially acetylated cotton is one. While it is not too likely that esterification of cotton with propionic, butyric, or isobutyric acids will yield startlingly different effects, these derivatives should be made and their properties evaluated.

Esters of aromatic acids such as benzoic acid might be of some interest, principally because of the physical effect that the benzoic acid might conceivably have in maintaining a separation of the cellulose chains in decrystallized fiber. There are, of course, a wide variety of aromatic esters and of mixed esters that could be prepared and which could yield interesting products.

As an alcohol, cotton will also form a variety of ethers. The methyl and ethyl ethers seem to be of not too much interest, probably because the degree of etherification is limited. If a commercially feasible way could be found to block most instead of a small percentage of the hydroxyls with methyl or ethyl groups, the products might prove valuable.

Some of the modified ethers are interesting. Hydroxyethyl cellulose can be prepared by the action of cellulose with ethylene oxide. Carboxymethyl cellulose can be prepared by reacting cotton with chloracetic acid. Both of these reactions yield a product that is soluble in water or in which the moisture take-up is greatly increased, depending upon the extent of the action. Contemplated uses by industry are not exactly volume markets.

A unique reaction of cotton involves treatment with beta propiolactone. The latter can react initially to form either an ether, carboxyethyl cellulose, or an ester, cellulose 3-hydroxy propionate. In either case, the new end group can react further with the beta propiolactone to form continuing chains or graft polymers. Reactions involving the take-up of as much as 48% beta-propiolactone have been carried out, but the products have not been thoroughly evaluated. With a take-up of 20-25% the fibers have about twice the bulk and diameter, and moisture absorbency is lowered to about 3 to 4%. There is little or no loss in breaking strength. So far it is a laboratory curiosity.

Cotton will react with 2-aminoethylsulfuric acid to form aminoethyl cellulose. Presumably, this could be used to create either secondary or tertiary amines or quaternary ammonium compounds.

Cellulose will form unsaturated ethers by reaction with allyl bromide. With halogenated compounds, such as ethylene-chlorobromide, it will form halogenated ethers.

Cellulose esters and ethers containing nitrogen may be prepared by treatment of the cellulose with an esterifying or etherifying agent containing the nitrile group, as for example, chloroacetonitrile or cyanoacetyl chloride. The products of these reactions may then be reduced to give amino derivatives.

One of the currently interesting chemical reactions of cotton is cyanoethylation. Acrylonitrile adds to cellulose to form cyanoethyl cellulose, and the reaction can be carried out easily on cotton fibers, yarns and fabrics. Cyanoethylated fibers have improved heat resistance. The treated cotton appears to have been bleached to some extent and to have acquired some luster. It is almost completely mildewproof. Further study and evaluation of acrylonitrile-treated cotton are certainly desirable. Obviously, the chemical modification of cotton is a field of exploration that offers tremendous challenge and opportunity for original research, for exciting accomplishment, and for profitable investment.

FUTURE COMPETITION WITH CHEMICAL FIBERS———We know that the manufacturers of synthetic fibers are exploring in detail the whole gamut of the chemistry of polymerization relating to their fibers. They are making and evaluating a wide variety of copolymers and simple mixtures of their polymers with compatible chemical materials. Their objective is clear. They want to develop in their products, in addition to the desirable properties they already have, some of the good properties now present in cotton, even as the cotton people are attempting to add to the good qualities of cotton some of the desirable characteristics of competitive fibers.

We should like to make it abundantly clear that we in the cotton industry regard this as the healthiest kind of competition, a competition in which cotton's future is bright for two reasons: First, the research departments of the chemical industry have recognized the huge potential market that awaits a new or improved finish for cotton at about the same time that they have grown to appreciate that a natural fiber like cotton can be modified successfully. Second, the cotton industry itself, after a late start, has accepted the competition with synthetic fibers as a challenge to produce a better product at a lower cost.

CONCLUSION

We believe that cotton has some fundamental advantages in this competition because of its fine structure and long molecular chain length created during its growth. We begin with a superior raw material. Cotton is responsive to virtually all of the techniques that can be applied to the chemical fibers except one — continuous extrusion. Finally, cotton can be improved through techniques not applicable to synthetic fibers: genetics and selective breeding.

Not long ago we were frankly alarmed at the seriousness of this competition. Today, we recognize it as serious, but we have abundant confidence in our own ability to measure up.

DISCUSSION

Question: As manufacturers of dyestuffs we have encountered considerable difficulty from what we think is an increasingly high calcium content in cotton, especially cotton that comes from growing areas where the harvesting is done by machine. May the source of this abnormally high calcium content, if it be such, come from the chemicals used for pest control or the defoliation before picking? What will the trend be with respect to this calcium content in the years ahead?

Answer: That is a good question, but frankly, I don't know the answer, and the condition has not been reported to me before. We would have taken great interest in this problem if we had known about it. I shall try to check with the people in cotton research to see if they have any information on the subject.

1953 Annual Convention
"Science Fibers" Group——

RECENT ADVANCES IN DYEING "ORLON" ACRYLIC FIBER AND "DACRON" POLYESTER FIBER AND BLENDS OF THESE WITH OTHER FIBERS*

J F LAUCIUS
E I du Pont de Nemours and Company, Inc, Wilmington, Delaware

INTRODUCTION

WE will attempt to bring up to date the most recent developments in dyeing the two new DuPont fibers, "Orlon" acrylic fiber and "Dacron" polyester fiber. We have all learned a great deal from our experience in dyeing increased quantities by various methods. Many of the problems which faced us no longer appear formidable. In fact, it is now obvious that both fibers can be dyed by reasonable procedures to give desired shades with good to excellent fastness. Particularly interesting shades are obtainable in many of the unusual blends now possible.

"ORLON" ACRYLIC FIBER

Most of the discussion of this fiber will deal with Type 42 "Orlon" with an occasional reference to Type 41, since quantities of this fiber are still being dyed. The first report on the dyeing of Type 42 "Orlon" was presented recently by Meunier, Laucius, Brooks, and Thomas *(1)*. Our presentation will deal with dyeing of basic, acid and disperse (acetate-type) dyes.

I Dyeing with Basic Dyes

The outstanding point of interest is in the development and application of new basic dyes. Contrary to experience with other fibers which has emphasized the extremely poor fastness of basic colors, they give very good fastness on "Orlon" acrylic fiber with brilliant shades and present a number of most unusual cross-dyeing and union effects.

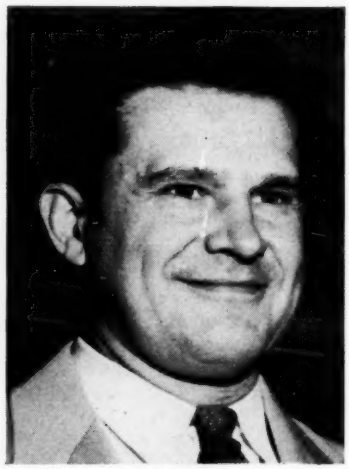
Basic dyes are applied by a simple direct dyeing process involving color, acetic acid and sodium acetate. In some cases specific surface-active agents are desirable. Since many of the common available basic colors are deficient in fastness and some application properties, intensive efforts have been centered on a search for much better dyes. As a result we have already developed three new dyes, DuPont Basic Yellow OL, DuPont Basic Red 4G, and DuPont Basic Blue OB, which form a nucleus of a new shade range with excellent wet fastness and good light fastness. These new dyes and selected old ones serve to dye ladies' suiting shades of adequate fastness, and a number of shades meeting men's suiting fastness requirements are possible. With continued research in this field, faster colors should result to adequately fill men's suiting requirements.

A number of the older basic colors have indicator properties and undergo shade changes during dyeing on Type 42 "Orlon" or in subsequent pressing tests. It has been found that the addition of 0.3% sodium acetate to the dyebath eliminates this effect.

The basic dye Fuchsine Conc becomes considerably bluer in five hours' Fade-Ometer exposure, and for this reason is useful only in navy-blue shades in combination with Victoria Green, which fades redder. This combination gives, surprisingly, about 20-40 hours' fastness. Fuchsine should not be used to shade brown, red, rust, or gray shades, since the fade after 5 hours is considerable in such combinations. Likewise, Victoria Green or Brilliant Green is not used alone to sadden browns, tans or grays. A mixture of about 10 to 20 parts of Basic Blue OB to 1 part of Brilliant Green should be used for this purpose. The Blue OB contributes light fastness, and the green neutralizes the reddish appearance of the former dye under incandescent light (at the expense of some light fastness). The exact ratio of green to blue will be a compromise depending on the light fastness and flare characteristics required. Many shades having light-fastness ratings of 4 or 5 and good resistance to washing have been worked out.

We have encountered an unusual phenomenon in that, with tertiary shades made with Basic Yellow OL, Basic Red 4G, and Basic Blue OB, the yellow component appears to fade first on light exposure. The original shade is restored immediately merely by heating the exposed portion. It was found that the red and not the yellow is responsible for this; Red 4G fades appreciably bluer in a few hours' exposure with the blueness disappearing on heating or many days storage in the dark. Thus, with garments which will be pressed occasionally, the light fastness will appear better in actual use than when a sample is exposed to light continuously without heating.

Much as nylon has limited dyeing capacity for the level-dyeing acid dyes, "Orlon" acrylic fiber has limited dyeing sites for uptake of basic dyes. There are enough dyeing sites to make navy blue with avail-



J F Laucius

An up-to-date summary of recent advances in the dyeing of "Orlon" acrylic fiber and "Dacron" polyester fiber is presented with special emphasis on the dyeing of blends of the two new fibers with presently available fibers. Recent developments in dyeing Orlon with dispersed, vat, and particularly basic dyes are covered. In addition, the cuprous-ion method of dyeing Orlon is reviewed, especially with regard to reducing agents, selection of dyes, and temperature of dyeing. In the dyeing of Dacron polyester fiber with disperse colors, the status with reference to carriers and pressure dyeing is given.

* Presented at the Conrad Hilton Hotel in Chicago on Sept 17, 1953. "Orlon" is the trade-mark for acrylic fibers manufactured by E I duPont de Nemours and Company. "Dacron" is the trade-mark for polyester fibers manufactured by E I duPont de Nemours and Company.

TABLE I

$$\frac{\%\ \text{Basic Yellow OL}}{4} + \frac{\%\ \text{Basic Red 4G}}{4} + \frac{\%\ \text{Basic Blue OB}}{4} + \%\ \text{Victoria Green Small Crystals} + \frac{\%\ \text{Brilliant Green Crystals}}{4} + \%\ \text{Fuchsine Conc} = K$$

able dyes. Care must be exercised to avoid using too large an excess of dye, since otherwise "blocking" may occur. We have devised an expression (using DuPont dyes) which can be used to determine whether blocking of dyes in a formula will result. (See Table I).

If K exceeds 1.5 per cent, the excess will not dye the "Orlon" acrylic fiber. In dyeing the heaviest possible shades, K values of 1.8 to 2 per cent represent the upper practical limit at a full boil. The use of a slight excess of dyes in dyeing 100 per cent "Orlon" will increase the rate of dyeing, so that the deeper shades are obtained in a shorter dyeing time. It is imperative that these dyes be applied at a temperature as close to the boil as possible.

When light to light-medium shades are desired, a leveling agent is needed to counteract the great affinity of the basic dyes. DuPont Retarder LAN is particularly useful. For pastel to light shades 2 to 3 per cent DuPont Retarder LAN (on weight of fiber, owf) is recommended; for light to light-medium shades 1 to 2 per cent should be used. The agent has no adverse effect on the fastness properties of the recommended basic dyes.

Rawstock and yarn have been successfully dyed in circulating equipment with excellent levelness, and this procedure should find increased use in the future.

II Dyeing with Disperse Dyes

Many disperse dyes on Type 42 "Orlon" have good fastness to light and washing. Although they dye only to light shades, they are extremely level and uniform in dyeing. They will find considerable use for dyeing knit jersey, sweaters and blends with rayon. Dyeing at higher temperatures under pressure does not increase their build-up appreciably.

The disperse dyes are applied in the usual manner at the boil for one hour or more in the presence of synthetic detergents, such as "Duponol" RA surface-active agent.

III Application of Acid Dyes

COPPER-ION METHOD —— Type 42 "Orlon" can readily be dyed a complete range of shades with selected acid dyes by the cuprous-copper method *(2)* at the boil at atmospheric pressure and at temperatures up to 230° F. As reducing agents for the formation of cuprous ion from the cupric ion, hydroxylammonium sulfate, sodium bisulfite, and glyoxal are preferred; hydroxylammonium sulfate is useful at the boil, while sodium bisulfite alone, or glyoxal combined with either sodium bisulfite or hydroxylammonium sulfate are preferred agents for dyeing above 212°. Sodium bisulfite is useful only in closed equipment since the acid pH dictated by the dyeing process leads to a loss of SO_2 and to a consequent lessening of reducing action. Since copper and dyes are absorbed very rapidly by Type 42 "Orlon," retarding agents, such as sulfonated dyeing assistants, i e, Compound 8, "Alkanol" WXN alkylaryl sodium sulfate and "Avitex" AD textile processing agent and nonionic surface-active agents, "Emulphor" ON and "Triton" X-100 may be used. In dyeings with hydroxylammonium sulfate as the reducing agent, the addition of one to two per cent sulfuric acid, to give a pH of about 2.0 in the dyebath, is particularly effective in slowing down the rate of dyeing.

Though the fiber requires dyes having specific dyeing properties, a complete range of acid dyes for application to rawstock, yarn or top in circulating machines is available. Table III shows a condensed list of colors having good application properties on Type 42 "Orlon" acrylic fiber.

In addition, a new offering with good to excellent fastness properties, "Roracyl" Black N, is being introduced for dyeing under pressure to supplement "Pontacyl" Fast Black N2B, which is sensitive to reducing agents at the higher temperatures. It is also very useful on Type 41 "Orlon" dyed at temperatures up to 250° F.

TABLE II
LIGHT FASTNESS OF DISPERSE DYES ON TYPE 42 "ORLON" ACRYLIC STAPLE

	%		Fade-Ometer Rating
Maize	0.15	"Latyl" Yellow YL	6
Baby Pink	0.05	"Celanthrene" Cerise B	6
Baby Blue	0.05	"Celanthrene" Brilliant Blue F F S Conc 200%	6

TABLE III
LEVEL-DYEING ACID COLORS FOR TYPE 42 "ORLON"

Dye (2%)	Light Fastness Fade-Ometer Rating
Quinoline Yellow PN	5-6
DuPont Orange II	5
DuPont Orange RO	5
DuPont Neutral Brown BGL	7
"Roracyl" Orange R	7
DuPont Crocein Scarlet N	4
"Pontacyl" Carmine 2G	4
"Pontacyl" Rubine R	5
DuPont Anthraquinone Rubine R	5-6
"Pontacyl" Violet 6R	5
DuPont Anthraquinone Violet 3RN	5
DuPont Anthraquinone Iris R	7
DuPont Anthraquinone Blue RXO	7
DuPont Anthraquinone Blue SKY	7
DuPont Anthraquinone Blue 3G	7
DuPont Anthraquinone Blue RA	7
DuPont Anthraquinone Blue AB	5
DuPont Anthraquinone Green G	6
DuPont Resorcin Brown 5G	7

CIRCULATING MACHINES —— It is advisable to incorporate a preshrinking treatment in the dyeing cycle since Type 42 "Orlon" acrylic fiber rawstock shrinks and packs more than Type 41 "Orlon." This treatment will diminish channeling and by-passing of the liquor around the sides of the rawstock cake. This is conveniently carried out by loading the stock into the kier half filled with water at 200° F. In order to obtain optimum levelness the dyeing rate may be suppressed by the use of the auxiliaries mentioned above and by a regulated heating cycle. The following is a typical dyeing procedure:

1) To the kier, add water and heat as close to the boil as possible (200-205°F).
2) Load the rawstock and distribute as evenly as possible to prevent channeling.
3) Put cover on kier, fill with water and adjust temperature to 160°F. Add dyeing retarder if desired.
4) Add dissolved color and circulate for 10 minutes.
5) Add dissolved copper sulfate, acid and any auxiliary chemicals; circulate 10 minutes.
6) Add reducing agent.
7) Heat to 195°F at 2°/minute, hold for 10 minutes.
8) Heat to 205°F at 1°/minute and run 10 minutes. If an atmospheric-pressure dyeing, run at 205-210°F for 30 to 60 minutes to get satisfactory color exhaustion. If a high-temperature dyeing, proceed as follows:
9) Raise temperature to 215° at 1°/minute and hold for 10 minutes.
10) Raise temperature to 225 to 230°F and hold for 30 to 60 minutes to obtain satisfactory color exhaustion.
11) Reduce temperature, drop bath, rinse, scour and finish as required.

This procedure will vary with the temperature at which the dyeing is carried out and with selection of the reducing agents. In the use of sodium bisulfite or mixtures of sodium bisulfite and glyoxal, the reduc-

TABLE IV
REDUCING AGENTS FOR TYPE 42 "ORLON" ACRYLIC STAPLE

	Per One Pound Cupric Sulfate Crystals	
	lb	
Hydroxylammonium sulfate (HAS)	0.4 -0.5	
Hydroxylammonium sulfate-glyoxal mixture	0.5	HAS
	0.25	glyoxal (30%)
Sodium bisulfite	0.25	
Sodium bisulfite-glyoxal mixture	0.25	bisulfite
	0.25	glyoxal (30%)

ing agents are added at 180° in place of 160° F, followed in a few minutes by closing of the machine for pressure dyeing. In dyeings at atmospheric pressure with hydroxylammonium sulfate, the reducing agent is best added in 3 portions over 20-minute intervals in order to suppress the rate of dyeing.

Table IV shows the quantity of reducing agent recommended.

TOP DYEING ——— In the early experiments, top dyeing was unsuccessful because of the distortion of the tops, which caused nonuniform flow of the dye liquor through the sliver. Level dyeings have now been made on the Fredericks and Abbott systems by reducing the liquor pressure.

This has been accomplished on the Fredericks system by installing a restricting valve between the discharge side of the pump and the spindle. Without stock present, an 18" head of liquor in the kettle and the pump running, the pressure was reduced through the use of the valve until no liquor was coming out of the top third of the spindle. Various other means of lowering the liquor pressure may be employed: for example, reducing the revolutions per minute of the pump by slowing down the motor; installing a lower speed motor; or if possible, changing the size of the pulley.

The reduction of liquor pressure on the Abbott system was accomplished by raising the cap of the spool ¾ inch, thus permitting the liquor pressure to expel itself through the top of the spool rather than through the stock.

The following system was used for dyeing with acid colors:

1) Wet out and set bath at 120°F.
2) Add sulfuric acid.
3) Circulate 5 minutes.
4) Add dissolved copper sulfate crystals.
5) Circulate 5 minutes.
6) Add dissolved color.
7) Circulate 10 minutes.
8) Add hydroxylammonium sulfate solution.
9) Raise to 160°F over 30 minutes.
10) Circulate 20 minutes.
11) Raise to 205°F over 30 minutes.
12) Circulate 20 minutes.
13) Raise to boil and boil until dyebath is exhausted.
14) Cool by overflow rinse to 120°F. (By cooling slowly in this manner, the dyed top remains soft and processes well.)
15) Drop bath.

IV Dyeing Blends of Type 42 "Orlon" Acrylic Fiber

1. BLENDS OF "ORLON" AND WOOL ——— Type 42 "Orlon" can be dyed efficiently by using the basic dyes on "Orlon" and a variety of acid dyes on wool. As indicated above, dyeings should be made as close to 212° F as possible; 0.3 per cent sodium acetate, 4 per cent glacial acetic acid and 1 per cent of an *aliphatic* nonionic dispersing agent, such as "Emulphor" ON, all per cent owf, are used in the dyebath to prevent staining of wool. It is to be emphasized that most commercially available nonionic surfactants have aromatic groups in their composition, and these will allow the wool to be stained considerably.

The dyeing process depends on the type of acid dye used: the level-dyeing acid dyes, the neutral-dyeing colors, the chrome dyes or the neutral-dyeing metallized dyes typified by the "Capracyl" class. The combination of basic dyes and acid dyes will not cause precipitation if processes outlined subsequently are followed.

With neutral-dyeing colors (milling type) the procedure is as follows:

1) Wet out at 110°F.
2) Add 0.5% "Emulphor" ON, 0.3% sodium acetate, and 0.3% acetic acid owf, and run 10 min.
3) Add milling dyes, run 10 min and raise to 175°F in 20-30 min.
4) Run 20 min at 175-180°F (milling dyes should be 80% or more exhausted; if not, add 0.2% acetic aicd and run 20 min).
5) Add basic dyes, pasted with 0.2% acetic acid and dissolved in boiling water. (Do not run live steam into the mixture as this may cause tarring.) Run 10 min.
6) Raise to the boil in 15 min, boil ½ hour.
7) Add balance of the acetic acid——total in the dyebath: 2%.
8) Boil 2 hours or longer until 95% or better exhaustion is obtained.

During the prolonged boiling, basic dyes transfer from the wool to the "Orlon" acrylic fiber. Since basic dyes have poor fastness properties on wool, the complete transfer of the basic dyes to the "Orlon" is essential. Additions of basic dyes may be made after cooling the dyebath to 190-200° F. For adjusting the shade of the wool component (which is not usually necessary in a blend of wool and "Orlon" in which the "Orlon" is the predominant fiber), level-dyeing acid colors may be added after cooling to 110-20° F; additions of milling colors after the full amount of acid is in the dyebath are apt to cause unlevelness.

Typical formulas for blends of wool and "Orlon" containing milling colors to obtain good wet fastness are given below: In these and all following shades, percentages are given on the *total* weight of fiber:

Brown—80/20 "Orlon"/wool

%	
2.4	DuPont Basic Yellow OL
0.84	DuPont Basic Red 4G
1.52	DuPont Basic Blue OB
0.087	DuPont Brilliant Green Crystals
0.35	DuPont Milling Yellow 5G
0.10	DuPont Milling Red SWB Conc 125%
0.256	DuPont Antraquinone Milling Blue BL

Rust—80/20 "Orlon"/wool

%	
2.0	Retarder LAN
1.54	DuPont Basic Yellow OL
0.64	DuPont Basic Red 4G
0.46	DuPont Basic Blue OB
0.003	DuPont Brilliant Green Crystals
0.28	DuPont Milling Yellow 5G
0.08	DuPont Milling Red SWB Conc 125%
0.05	DuPont Anthraquinone Milling Blue BL

For light shades employing DuPont Retarder LAN, a two-bath process may be desirable. The "Orlon" acrylic fiber is first colored with basic dyes using retarder, acetic acid, sodium acetate, and nonionic surface active agent. In the second bath the wool is dyed by conventional means.

When "Capracyl" dyes are used for the wool, a similar two-bath procedure is usually employed, the retarder again being used only for light shades.

1) Wet out and add full amount of acid, "Emulphor" ON and sodium acetate. Run 10 min, then raise temperature rapidly to 160°F.
2) Add basic dyes and run 10 min.
3) Raise temperature to the boil in 30 min and run 45 min at the boil.
4) Drop bath.
5) To a fresh bath, add 0.5% "Emulphor" ON and run 10 min.
6) Add dissolved "Capracyl" dye. Run 10 min.
7) Raise to 200°F in 40 min.
8) Run 30 min at 200-205°F.

The two-bath procedure is used to avoid the risk of precipitation; dyes of the "Capracyl" class may form precipitates with basic dyes.

Typical gold and grey formulations are as follows:

Gold—80/20 "Orlon"/wool

%	
2	DuPont Retarder LAN
0.68	DuPont Basic Yellow OL
0.026	DuPont Basic Red 4G
0.010	DuPont Basic Blue OB
0.001	DuPont Brilliant Green Crystals
0.15	"Capracyl" Yellow NW

Gray—50/50 "Orlon" acrylic fiber/wool

%	
3	DuPont Retarder LAN
0.120	"Capracyl" Gray GN
0.040	"Pontachrome" Brown BGL
0.052	DuPont Basic Yellow OL
0.030	DuPont Basic Red 4C
0.125	DuPont Basic Blue OB
0.008	DuPont Brilliant Green Crystals

In the latter case the "Capracyl" Gray GN can be used in the one-bath method, since precipitation does not occur.

The following example illustrates the use of chrome colors for making a navy:

Navy—50/50 "Orlon"/wool

%	
1.2	"Pontachrome" Blue Black RM Conc
0.42	DuPont Victoria Green Small Crystals
0.14	DuPont Fuchsine Conc
0.27	DuPont Basic Yellow OL

1) Wet out and add 0.3% sodium acetate, 0.5% "Emulphor" ON, 0.3% acetic acid glacial. Run 10 min.
2) Add acid dye(s). Run 10 min. Raise to 175°F in 20 min. Run 20 min at 175°F.
3) Slowly add 0.2% acetic acid. Run 15 min. Add basic dyes. Run 10 min.
4) Raise to the boil in 15 min. Boil ½ hour.
5) Add the balance of the acetic acid for a total in the dyebath of 2%. Boil 2 to 3 hours.
6) Top-chrome in the same bath 40 min at the boil with 0.8% sodium dichromate.
7) Rinse, scour 15 min at 180°F with 1% "Emulphor" ON and 0.3% acetic acid.

This formula represents about the deepest shade that can be obtained with basic dyes on "Orlon" acrylic fiber under practicable conditions.

"Orlon" Dyed —— Wool Undyed: All of the above and similar shades can be dyed on the "Orlon" acrylic fiber with the wool left white by starting the dyeing with the full amount of acid, "Emulphor" ON, sodium acetate and basic dyes at 160° F and by raising to the boil and boiling 2-3 hours. A slight amount of wool staining may be noticed with shades containing considerable amounts of Brilliant Green or Victoria Green and Fuchsine (navies). This stain is readily removed by stripping for 15 min at 180° F in a bath containing 1 g/l of "Sulfoxite" S color stripping agent and 1 g/l of acetic acid. The stripping has no noticeable effect on the shade of the "Orlon."

Contrasting Shades: In cross-dyeing contrasting shades on the wool and the "Orlon," no staining of the wool by the basic dyes can be tolerated. It is advisable to adhere strictly to the principles for avoiding wool staining previously indicated.

Medium and light shades on the "Orlon" (any depth of shade on the wool) are readily dyed by following the procedures described for dyeing solid unions. For deep shades of navy blue and brown on the "Orlon" (the depth of the shade on the wool is immaterial), it is advisable to dye the "Orlon" first and then to strip the wool as just described. After thorough rinsing, the wool may be colored as desired at 200-205° F.

Scouring: For all three types of dyeing procedures, we have found that scouring after dyeing is best carried out with 1 per cent "Emulphor" ON and 0.3 per cent acetic acid at about 160° F. Both the detergent and the acid help to remove basic dye from the wool, and the acid (which may be varied in amount) prevents stripping of the acid dyes from the wool.

2. "ORLON" ACRYLIC FIBER BLENDED WITH RAYON OR COTTON: —— The one-bath method for simultaneous dyeing of the two components has been used with disperse dyes for the "Orlon" and direct dyes i the cellulose fiber in light shades. For medium shades, we have found that the new basic dyes not only reserve the rayon but they are compatible with the direct colors dyed at a pH slightly below 7.

For dyeing unions in deep shades, a two-bath procedure is indicated where the "Orlon" is dyed either with acid dyes by the cuprous-ion method or with selected basic dyes. When the cuprous-ion method is used, a scour with sequestering agent is given to remove copper from the rayon. The rayon is then dyed with direct colors selected on the basis of minimum staining on the "Orlon."

In scouring the blend of cotton and "Orlon," the cotton boil involving caustic soda at elevated temperatures for a long time should be avoided. This treatment will degrade and discolor the "Orlon."

"DACRON" POLYESTER FIBER

As is well known, "Dacron" is dyeable with disperse colors typified by "Acetamine," "Celanthrene," and "Latyl" dyes, and the mechanism involved is one of solution of dye in the fiber as disclosed by Schuler and Remington *(3)* and Reith and Andres *(4)*.

Since the diffusion of these dyes in the fiber is very slow, recourse is made to the use of carriers (5) and high temperatures which increase the rate of dyeing of the colors.

I Dyeing without Carrier

"Dacron" rawstock and top are readily dyeable in circulating machines without the use of carrier at temperatures of about 250°. The method that leads to most successful dyeings is that of exhausting the disperse dye with 1.5 to 5 g/l of an inorganic acid, such as sulfuric acid, or simple organic acid, such as formic or acetic (as disclosed in Reference *6)*, followed by heating up to 250° for penetration and fixation of color.

Diazotizable disperse dyes can be applied at 250°, followed by further development with 2-hydroxy-3-naphthoic acid and nitrous acid at atmospheric pressures *(12)*.

The dyeing of fabric made of "Dacron" in the Barotor *(8)* by the method described for the dyeing of top at 250° has been satisfactorily demonstrated.

"Dacron" polyester fiber top and tow can be padded with disperse dyes in the presence of a wetting agent and a thickener and steamed under pressure to cause diffusion of the dye into the fiber *(7)*.

A typical procedure follows. A paste containing dye is made up of:

Parts	
1-10	color
88-78	water
0.80	"Alkanol" DW alkylarylsulfonate solution
10.00	Textile Gum or "Keltex" (4%)
0.50	pine oil (as antifoam)

The top or tow is padded to a 100% pickup and then steamed directly without drying. Steaming at 25 psi for 30-45 minutes usually is sufficient to fix most disperse dyes. Dyes having faster dyeing rates can be fixed at 10-15 psi in one hour.

II Carrier Dyeing

Many carriers *(9)* are useful in the dyeing of "Dacron," and from the thousands of compounds examined, we shall discuss briefly four particular types: 1) chlorinated benzenes, 2) benzoic acid, 3) phenols, and 4) phenylmethylcarbinol.

The chlorinated hydrocarbons are toxic; trichlorobenzene does show promise for dyeing light and medium shades, but it has a number of disadvantages. Its toxicity has been investigated by Rozanova *(10)*, who found that concentrations ranging from 27-40 parts per million produced pathological changes and poisoned the vascular nervous system in animals. One should exercise great care in handling this chemical. Another disadvantage of trichlorobenzene is that it shows good carrier action over a very narrow range of concentrations (about 5 g per liter at beck volumes); since the product distills, careful control must be exercised during the dyeing.

Benzoic acid gives the best-quality dyeing, but it is expensive. We are searching for less expensive derivatives of this class.

Among phenols, o-phenylphenol, which is cheap and commercially available, has been the subject of most practical investigations. Since it becomes an oil at dyebath temperatures, careful handling is imperative. It decreases the light fastness of many colors, and it cannot be scoured completely from the fiber. Scouring with caustic soda at 180-200° or water at the boil, where possible, is recommended since this treatment removes about half of the absorbed o-phenylphenol.

Phenylmethylcarbinol has been indicated to be useful in dyeing "Dacron" polyester fiber, especially in unions of "Dacron" and acetate *(11)*. Evaluation of this carrier indicates that it is quite expensive, gives limited build-up and requires high concentrations in the dyebath to give efficient dyeing.

UNION-DYEING BLENDS OF "DACRON" POLYESTER FIBER

I Blends of "Dacron" and Wool

Many useful shades with adequate fastness have been made, and the important details will be outlined briefly.

In union dyeing, color selection of the disperse dye to minimize staining of the wool must be made, and the wool can be dyed with acid dyes typified by the level-dyeing types, chrome, premetallized acid dyes, etc.

The following process *(13)* typifies the procedure for dyeing with chrome dyes for wool:

1) Wet out the fabric with 1% "Emulphor" ON or 1% "Duponol" RA surface-active agent.
2) Dissolve *completely* 5 g/l "Dowicide" A along with 0.2 g/l caustic soda and add to the beck at 110-120°F. It is imperative that this solution not be exposed to acid vapors.
3) Just as soon as the "Dowicide" A solution is well mixed——not more than 15 minutes——add dilute acetic acid (not stronger than 10%) over a period of about 15 minutes to lower the pH to 5-6. Use of an add tank is desirable. All of the above operations should be carried out with the beck closed.
4) The fabric should not circulate more than 10-15 minutes after the addition of the acid before the dyes are added. The disperse dyes should be pasted up with 0.5% "Duponol" RA surface-active agent. Add the wool dyes made up in the usual way.
5) Raise the temperature to the boil over 30-45 minutes and hold at 212°F for 2 hours.
6) Reduce the temperature to 180°F and add 1½% acetic acid and 1% sodium dichromate. Raise the temperature to 212°F and hold for 45 min.
7) Scour for 15 min with 2% "Duponol" RA surface-active agent.

The preferable procedure would be to add all of the "Dowicide" A slowly to the acid bath at the boil. In this way a saturated solution would never be encountered, for the solubility of the carrier in the fiber and in the bath is great enough at the boil to prevent an insoluble phase. This would eliminate the possibility of oil spots. Unfortunately, the wool is stained slightly more by such a procedure. Excessive amounts of dispersing agent should be avoided; for example, exactly 1 per cent "Emulphor" ON or "Duponol" RA is recommended. The former agent gives less wool staining and some retarding action, thus leading to more level dyeings.

II Blends of "Dacron" Polyester Fiber and Cellulosic Fibers

In dyeing blends of "Dacron" with cellulosic fibers, application of vat dyes on the cellulosic portion followed by dyeing of the "Dacron" affords a very efficient two-step method of producing fast dyeings. In dyeing the blend of "Dacron" and rayon, direct colors for the rayon and disperse dyes for "Dacron" can be dyed with trichlorobenzene as a carrier in a one-bath method or with "Dowicide" A as a carrier in a two-bath method. Trichlorobenzene must be properly emulsified to prevent oil and tar spots on the fiber. Use of this agent leads to good reserve on viscose. The toxicity of the chlorinated benzene again should be emphasized.

SUMMARY

Recent advances in the dyeing of "Orlon" acrylic fiber and "Dacron" polyester fiber have been described with special emphasis on the dyeing of blends with wool and cellulosic fibers.

For Type 42 "Orlon" acrylic fiber disperse (acetate-type) dyes are useful for light shades and acid dyes for medium and dark shades. The new basic dyes are very promising and offer means of dyeing blends of "Orlon" with other fibers, particularly wool, by a simple direct process.

"Dacron" polyester fiber can be dyed efficiently with disperse dyes in the presence of carriers or at high temperature. By proper selection of carrier and process conditions, blends of "Dacron" with wool and rayon can be dyed successfully.

ACKNOWLEDGMENTS

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DISCUSSION

Question: Have you any information on the relation of the pH of the carrier in "Dacron" dyeing and the efficiency of the carrier?

Answer: There is no relation as far as I am aware. The partition of carrier between water and "Dacron" is probably the determining factor.

Q: What is the effect of carriers at high temperatures?

A: Many carriers are active at high temperatures and usually at lower temperatures and concentrations.

Q: What effect do these carriers have on light fastness? Do they cause yellowing?

A: Benzoic acid can be scoured out effectively, and thus does not impair light fastness. Trichlorobenzene will not affect light fastness. However, the o-phenylphenol is difficult to scour out completely and tends to turn yellow upon exposure to light. This yellowing may make yellows seem faster to light, but it makes most colors turn yellower with exposure.

Q: I want to compliment the speaker on a fine set of slides. I could really see them from the back row.

A: Thank you. My colleagues showed this type at the Faraday Society in Leeds, England, where they were asked how we made them. Our technician who makes the slides will be very happy that people have liked them, and we will tell him so.

NEWS

• CSMA to Hold 40th Annual Meeting in Washington

J Earl Coke, Assistant Secretary of Agriculture, will speak at the 40th annual meeting of the 39-year-old Chemical Specialties Manufacturers Association to be held at the Hotel Mayflower, Washington, D C, Dec 7 and 8. Mr Coke will address the group luncheon on Tuesday, Dec 8.

Special events at the meeting will include the honoring of three of the founders of the association who are among those still living: M M Marcuse, West Disinfecting Co; Karl B Dolge, C B Dolge Co; and Fred A Hoyt, retired.

CSMA's second annual Achievement Award will be presented to F B LaForge and Milton S Schechter for their work on insecticides as scientists with the U S Department of Agriculture.

The 40th annual meeting is expected to be the largest in CSMA's history. Nearly 1,000 manufacturers and suppliers of chemical specialties having a combined retail value of over $2,000,000,000, will be represented.

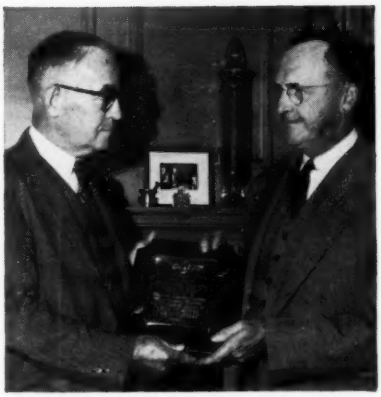
• Givaudan-Delawanna Expands Detroit Offices

The Detroit office of Givaudan-Delawanna, Inc and its associate companies, Givaudan Flavors Inc and Sindar Corporation, opened new and expanded offices on November 2 at 18228 Mack Avenue. The office is under the management of R M Stevenson who is assisted by his son, James L Stevenson, who recently joined his father in representing the Givaudan organization. The phone number at the new quarters in Detroit will be TUxedo 2-8405.

• O-Twist Dacron Dyed by CY&D

Herbert Girard, director of research and development, has announced that Central Yarn and Dyeing Company, Gastonia, N C, has successfully package dyed Du Pont's new zero-twist Dacron yarn in a full range of colors.

Following pilot samplings several adjustments in Central's high-pressure, high-temperature system for synthetics dyeing have led the Company to announce its readiness to package dye production quantities as the new yarn becomes available.



S C Moody (right), Calco Chemical Division, receives the New Jersey Manufacturers Association's "Award of Merit" plaque for public relations communications from Michael J Hickey, Association secretary.

• Calco Given "Award of Merit"

Calco Chemical Division, American Cyanamid Company, Bound Brook, N J, has been given the "Award of Merit" for public relations communications by the New Jersey Manufacturers Association.

The award was presented to S C Moody, vice president of American Cyanamid and general manager of Calco Chemical, by Michael J Hickey, secretary of NJMA.

Mr Hickey pointed out that Calco is giving employment to more than 4,000 people living in 121 Central and North Jersey communities, and in its contribution to the cultural life of the Somerset area is an outstanding example of the influence of industry on the general welfare of the State.

The award was presented in conjunction with "The Voice of New Jersey" radio series.

• Indiana Firm Begins Production of 4-Vinylpyridine

Reilly Tar & Chemical Corporation, Merchants Bank Bldg, Indianapolis 4, Ind, has started commercial production of 4-Vinylpyridine, according to a recent announcement by Peter C Reilly, president.

The affinity of the pyridine nitrogen indicates the usefulness of 4-vinylpyridine in improving the dyeing characteristics of some of the synthetic fibers.

• Borden's Acquires APC

The acquisition of the American Polymer Corporation of Peabody, Mass, has been announced by William F Leicester, vice-president of The Borden Company and president of Borden's Chemical Division. The move, he explained, is in line with the division's policy of expansion in the field of basic chemicals.

The acquisition includes American Polymer plants in Illiopolis, Ill, Montreal, Canada and in Sao Paulo, Brazil, as well as Peabody. All produce resin emulsions and solutions of various types from a number of base monomers. American Polymer does not produce end products, but sells to manufacturers.

American Polymer will operate as a separate department of Borden's Chemical Division, strengthening the Company's polymerization facilities for increased production of vinyl, butadiene, styrene and acrylic and methacrylic emulsions.

Present plans call for the opening of an American Polymer sales office in Boston, Mass. Expanded facilities for manufacturing, as well as for research and development, are planned for the near future.

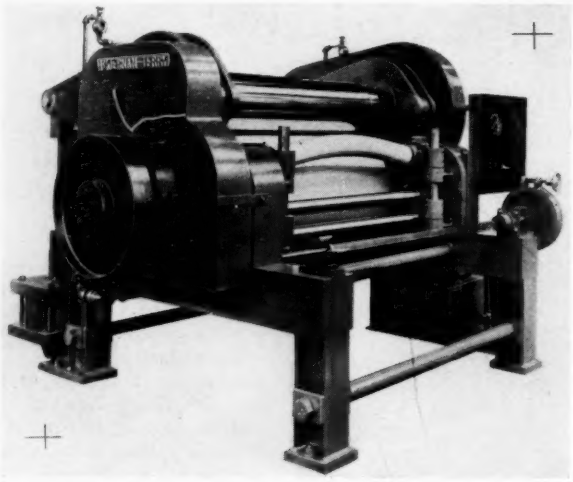
American Polymer Corporation was founded in 1944 by William Abramowitz, who is now a director; Ashworth Stull, president; and S J Baum, general manager. These and other executives will remain to operate the department. The present sales force will also continue with the company.

• Geigy Co, Inc Merges with Affiliate

The merger of Geigy Co, Inc, pioneers in the dyestuff field, with their affiliate, Geigy Chemical Corporation, became effective on October 30th.

A newly designated division, Geigy Dyestuffs, will operate Geigy's eight dyestuff branches in the United States and Canada, without change in personnel. The organization will continue to serve the textile industry with its broad line of dyestuffs and auxiliaries.

In addition to Geigy Dyestuffs, the company's expanding operations will be carried out by three other newly created divisions, Geigy Agricultural Chemicals, Geigy Pharmaceuticals and the Patent Licensing and Service Division.



McKiernan-Terry Multipurpose Calender

McKiernan-Terry Corporation has introduced a new machine that will function as a friction, Schreiner and embossing calender and is specially adapted for use with resin finishes. It is converted from one service to another by simply changing rolls and gears. It is reported that the changeover takes only a few hours.

The calender is equipped with special oil seals to withstand high temperature, a lubricating oil circulating and cooling system, and heavy-duty antifriction roll bearings. The latter and their housings are removable by hydraulic pressure. The unit is built for pressures up to 75 tons, hydraulic or pneumatic.

Further information can be obtained by addressing McKiernan-Terry Corporation, Dept A, Harrison, New Jersey.

• NID Host to Textile Teachers

The National Institute of Drycleaning played host to a large group of textile and clothing teachers holding their Eastern Region meeting in Washington, D C, October 22-24, 1953. Seventy teachers from eastern colleges attended the 3-day meeting at the Shoreham Hotel.

Their conference included field trips to the textile museum, to the Bureau of Human Nutrition and Home Economics at the Agricultural Research Center in Beltsville, Maryland, and to the offices, plant and laboratories of the National Institute of Drycleaning at Silver Spring, Maryland.

Dorothy Siegert Lyle, Director of Consumer Education at NID and a former teacher of textiles at Ohio State University, conducted the tour at the Institute.

Principal speakers at the conference were Mildred Horton, executive secretary of the American Home Economics Association; William R Pabst, Jr, of the Quality Control Division of the Bureau of Ordnance, Department of the Navy, and Ruth O'Brien, assistant chief of the Bureau of of Human Nutrition and Home Economics of the Department of Agriculture.

Elizabeth Armstrong, Pennsylvania State College, was chairman of the coordinating committee that set up the meeting, and Fay Mitchell, University of Maryland, was chairman of the local arrangements committee.

• Hopewell Organic Development Center Opens

Hugo Riemer, president of the Nitrogen Division, Allied Chemical & Dye Corporation, speaking at the recent opening of the Division's Organic Development Center at Hopewell, Va, predicted that "the most startling developments in chemistry in the next few years will be in the organic field, based largely on petroleum derivatives and natural gas," He explained that the purpose of the new development center is to expand the Division's participation in the organic field, while at the same time continuing their nitrogen research on a broad basis.

The new center, located in a wooded section of Hopewell adjacent to the Division's ammonia laboratory, consists of two buildings which together provide nearly 40,000 square feet of working space. The air-conditioned research and engineering building houses the laboratories and the engineering staff and the smaller experimental building is for intermediate scale research. Construction of the new development center was begun 11 months ago by the Wigton-Abbott Corporation.

Nitrogen division officials participating in the dedication ceremonies included M F Fogler, executive vice president; C S Fazel, vice president in charge of research, and Frank O Agel, director of development of the Division's organic section.

• New 300-Ton Chlorine Unit

Wyandotte Chemicals Corporation last month announced the bringing on stream of its new 300-ton chlorine unit, completing a broad expansion of its manufacturing and research facilities in Wyandotte, Mich. As a result of the program, Wyandotte reportedly has increased its output of soda ash by 20 per cent and chlorine by 75 per cent.

Wyandotte's expansion of chlorine and soda ash facilities is in line with its intention to maintain its primary position in the product fields for which the company was founded. In addition, however, a long range development program looking toward greater activity in the organic chemical field is progressing. The company now produces a number of organics and gradually is increasing its participation in this branch of the chemical industry with higher and higher percentages of Wyandotte total output falling within the organic classification. Future expansion in this field is anticipated.

The 63-year-old company operates three plants in Wyandotte, limestone quarries at Alpena, Mich, and smaller operations in Los Angeles, Calif, Blue Mountain, Tenn, and Calvert, Kan.

• Butterworth Increasing Research on Finishing Techniques

H W Butterworth & Sons Co, Bethayres, Pa, is placing increased emphasis on research into textile finishing techniques.

At present, Butterworth engineers are doing basic research on high frequency dyeing and sonic impregnation and extraction. In the accelerated research program, Butterworth is offering the services of their engineers in the development of improved techniques in drying, bleaching, dyeing and finishing.

• Improved Acrilan Developed

The development of an improved Acrilan acrylic fiber in the research laboratory, with findings confirmed on pilot plant and production equipment, was announced earlier this month by Osborne Bezanson, president of The Chemstrand Corporation.

The fiber reportedly has undergone satisfactory initial evaluation on full-scale mill equipment in the Textile Research Department of American Viscose Corporation, which has conducted this work on contract. TRD has converted the fiber into fabrics of various blends and constructions and the fabrics are currently undergoing wear tests.

• Nopco Acquires Major Canadian Producer

Nopco Chemical Company, Harrison, N J, has announced an important addition in the purchase of the controlling interest of Yocum Faust, Ltd, London, Ont, Canada. The subsidiary company will continue to operate under its original name, Yocum Faust, Ltd.

The addition gives Nopco facilities for production and distribution in Canada of its line of industrial processing chemicals and vitamin products. Founded in 1907, the company today supplies over 300 chemical specialties.

Yocum Faust, Ltd, is set up to perform sulfonation, esterification, refining, pressing and heat treatment. In addition, the Canadian company produces lard oils and neatsfoot oils and has pioneered in the development of processed rapeseed oil, used by the petroleum industry.

According to Thomas A Printon, Nopco President, plans are being formulated to give the Canadian organization the benefit of Nopco's extensive research facilities. Nopco intends to add considerably to the Canadian plant, to accommodate expansion of production and sales in the industries in which Nopco is now well established, such as textiles, paper, tanning, etc, and also in those industries toward which Nopco research and pilot work has been increasingly directed.

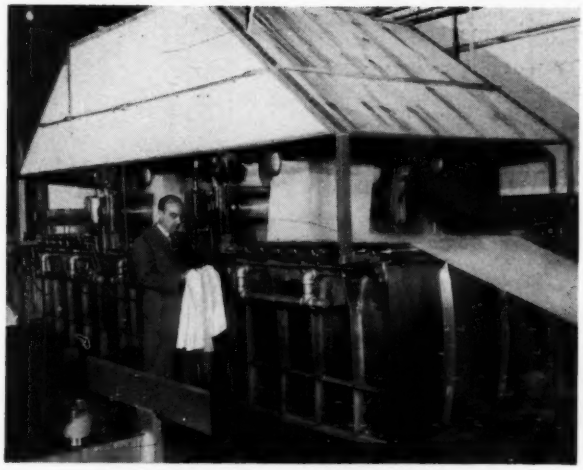
The new Board of Directors of Yocum Faust Ltd, are: Thomas A Printon, G Daniel Davis, Ralph Wechsler, Robert F McClellan, Thomas A Faust. Officers are: Mr Printon, President, Mr Davis, Vice-president; Mr Wechsler, Treasurer; Mr McClellan, Vice-President and General Manager; and Miss Jean Mosely-Williams, Secretary.

• New WVPPC Division

West Virgina Pulp and Paper Company has announced the formation of a new division at Charleston, S C, to broaden the commercialization of its lignin products.

The division will be under the direction of Paul Wiley, who has been director of the company's Development Department at Charleston, S C, since 1947.

The new organization, which has begun operations, will be known as West Virginia Pulp and Paper Company, Polychemicals Division. Its activities will embrace all phases of lignin operations, including production, product and uses development, sales and administration. The personnel will be drawn largely from members of the Charleston Development Department who have long been associated with lignin.



Frank J Percarpio, president of Northern Dyeing Corp, Washington, N J, examines a sample of bleached rayon-cotton fabric.

• Jersey Firm Guaranteeing Less Than 2% Shrinkage in Rayon-Cotton Mixtures

Northern Dyeing Corp, Washington, N J, is now guaranteeing less than two percent shrinkage in its line of rayon-cotton mixtures, a protection that has been extended to include this company's entire line of bengalines, failles and ottomans, by means of a printed seal bearing their trademark, "Super Characterized". The seal is distributed to all their customers for attachment to garments made from these goods. Northern Dyeing's shrinkage figure compares with those established recently by the National Institute of Drycleaning wherein shrinkage ranging from 3 to 12 percent was noted in other rayon-cotton materials of these types. Consistent maintenance of a low rate of shrinkage has earned for Northern Dyeing Corp the first seal of approval ever granted by *Good Housekeeping* for these fabrics.

Frank J Percarpio, president of Northern Dyeing and its associated company, Castle Creek Prints, Inc, upon receiving *Good Housekeeping's* award, drew attention to the use of two Tensitrol washers in the process. The Tensitrol washers are made by Rodney Hunt Machine Co, Orange, Mass.

• National Aniline Reduces Resin Chemical Prices

National Aniline Division, Allied Chemical & Dye Corporation, New York, has reduced prices on maleic anhydride and fumaric acid from 32c per pound to 27c per pound, carload lots.

• 2nd Chemical Finishing Conference

The progress being made in the development of "man-modified" natural fibers underwent considerable scrutiny last month as some of the nation's prominent textile scientists gathered in Washington, D C for the 2nd Annual Chemical Finishing Conference.

The conference was the second arranged by the National Cotton Council at which information on the newest developments in the cotton textile field can be exchanged. The Council believes that, by extending the specialized uses to which cotton can be put, increased consumption at home and abroad can be encouraged.

Sydney M Cone, president of the National Association of Finishers of Textile Fabrics and vice president of Cone Mills, Inc, served as general chairman of the meeting.

Speakers included: Jack Compton, Institute of Textile Technology, Charlottesville; Charles F Goldthwait, Southern Regional Research Laboratory, New Orleans; Theodore F Cooke, Calco Chemical Division, American Cyanamid Company, Bound Brook, N J; Lawrence L Heffner; William E Hooper & Sons Co, Baltimore; Edward Abrams, Southern Research Institute, Birmingham, Ala; Mary Rollins, Southern Regional Research Laboratory; Henry A Rutherford, North Carolina State College, Raleigh, N C; Raymond J Andres, E I du Pont de Nemours & Co, Inc, Wilmington, Del; Albert C Nuessle, Rohm & Haas Co, Philadelphia, and Wilson Reeves, Southern Regional Research Laboratory.

(See page 777 of this issue for the complete paper by Abrams and Sherwood on "Nitrile Rubber Latices as Permanent Abrasion-Resistant Finishes for Blue Denim Fabric").

• Colgate-Palmolive-Peet Shortens Name

Colgate-Palmolive-Peet Company has shortened its name to Colgate-Palmolive Company. The shorter name was approved by the Company's stockholders at their annual meeting in April and the change became effective on October 30th.

In the normal course of business, the packaging of the Company's products, including soap and toilet goods, and other printed matter will be revised to reflect the new name. It was pointed out that supplies of certain materials bearing the old name will be used until exhausted.

No change in corporate entity is involved.

• Seventh Warehouse Opened By Koppers Chemical Division

A warehouse for polystyrene, adhesives and other chemicals manufactured by the Chemical Division of Koppers Co, Inc has been opened at 1448 Wabash Ave, Detroit, Mich. Other Division Warehouses are located at Easthampton, Mass, Kearny, N J, Nashville, Tenn, Chicago, Ill, Youngstown, O, and Los Angeles, Calif.

W V De Galan is the Company's Detroit sales representative, with offices in the United Artists Building, 154 Bagley Ave.

• Permachem Moves to Florida

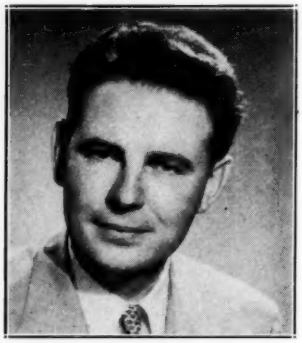
Cecil P Young, president of Permachem Corp, has announced the removal of the company's general office and development laboratories to 5610 Georgia St, West Palm Beach, Fla. The company will maintain a district office in New York at 41 East 42nd St.

Mr Young points out that the new quarters will provide adequate space for additional technical and research personnel required to adapt Permachem's "germ-free" process to additional new materials, including synthetics which heretofore have not been dealt with.

• New York Chapter, AIC, Meeting

The New York Chapter of the American Institute of Chemists met on October 22nd at Stouffer's Restaurant in New York to hear Dr Walter Smith, Godfrey L Cabot Company, Boston, Mass, discuss "The Missing Lambda Constant".

Many lady guests of the Institute attended, since Dr Smith's talk was nontechnical. The title of his talk referred to an imitation of Debye doing a long mathematical derivation, but at the end realizing with dismay that he had omitted "the Lambda constant".



R B Seymour

• Plea for Proper Use of Plastics

A plea for corrosion engineers to understand the right use of plastics was made by R B Seymour, a leading authority in the plastics field, in an address to the Houston Section meeting of the National Association of Corrosion Engineers on Oct 20.

The speaker, executive vice president and general manager of the Atlas Mineral Products Co, Mertztown, Pa, predicted tremendous growth for industrial plastics in the field of extruded, laminated and reinforced plastic materials based on plastics which are already available commercially. He opined that considerable advances in research, design and application of such materials will permit the construction of chemical equipment heretofore considered impossible. Dr Seymour described and compared more than twenty completely different plastic materials regarding their resistance to water, salts, alkalies, acids and organic solvents, and gave specific examples as to the use of each.

• R I School of Design Celebrates 75th Anniversary

The Rhode Island School of Design, Providence, R I, staged a mammoth 2-day program of events last month in celebration of the school's seventy-five anniversary.

The program began with an alumni association anniversary dinner at the Narragansett Hotel on October 23rd. Speakers included Samuel H Ramsey, Al Capp (creator of the comic strip Li'l Abner), Senator T F Green (D-R I), and Secretary of State Armand H Cote. Harold A Allan '23, president of the alumni association made the anniversary presentation to Dr Max W Sullivan, RISD president.

The following day, an academic procession moved from the main college building to the college auditorium for the convocation. William D Fales, chairman of the Division of Textiles, acted as chief marshal of the procession.

Francis J Deignan, dean of students, acted as marshal for the first section of the procession, which included Chairman of the Board of Trustees Mrs Murray S Dandforth, President Sullivan, participants in the program, Senator Green and other members of the board of trustees. Dr John Maxon, director of the Museum of Art, headed the procession's second section consisting of the delegates of forty-five educational institutions and associations. Albert E Simonson, chairman of the Division of Liberal Arts, served as faculty marshal. Representatives of the college's Alumni Association and student body also participated in the processional. Leslie J Allen '55, James O Gallant '55, and Theodore L Newberg '55 were the flag bearers.

W Ralph MacIntyre, president of Joseph Bancroft and Sons Co, Wilmington, Del, delivered the principal address at the convocation, which delegates of New England colleges and universities, members of the National Association of Schools of Design, and other representatives of educational and professional associations attended. William H Edwards, Providence attorney and secretary of the School of Design corporation, presided at the ceremonies, Governor Dennis J Roberts and Mayor Walter H Reynolds extended greetings from State and City, and Dr Sullivan made the President's Response to the speakers and dignitaries participating in the observance. The invocation and benediction were delivered by the Reverend Cornelius B Collins, chairman of the State Board of Education.

The establishment by Rhode Island School of Design of the Royal Bailey Farnum Scholarships was announced by Dr Sullivan, during the exercises. Dr Farnum, one of the nation's leading authorities on industrial art, was seated on the platform as Dr Sullivan paid tribute to his seventeen years of leadership as education director and executive vice president of the School of Design. Dr. Farnum retired in 1946.

The Farnum Scholarships will be six full-tuition grants for the freshman year available to public and private secondary school seniors who live outside of Rhode Island. The first six scholarships will be awarded for the 1954-55 academic year.

• Hewson Moves to Larger Quarters

The Hewson Company, Inc, has moved to new and larger quarters at 443 Broad Street, Newark 2, New Jersey. The new telephone: HUmboldt 3-3000.

NAMES IN THE NEWS

J P Boksenbom

JOHN PHILIP BOKSENBOM has been elected president of American Dyewood Company and New York Color and Chemical Company, Inc, both wholly-owned subsidiaries of United Dye and Chemical Corporation, formerly United Dyewood Corporation,

Mr Boksenbom has served with the Radio Corporation of America for the last 12 years, most recently as vice president in charge of the Consumer Products Division of the RCA Service Co, Inc. Mr Boksenbom has also held executive positions with Union Carbide and Carbon Company, Bound Brook, N J.

WILLIAM E BERRY, executive vice president of Riegel Textile Corporation, retired from active duty under the Company's pension program on November 1st after 47 years in the industry, the last 27 with Riegel. Mr Berry will continue as a director and will also serve as a consultant for the firm.

With Mr Berry's retirement the following realignment of executives takes place:

WILLIAM A REID becomes executive vice president.

VAN COURT ADAMS succeeds Mr Reid as vice president and sales manager.

ROBERT POISSON, former manager of branch office sales, becomes assistant general sales manager.

THE Board of Directors of Michigan Chemical Corporation, St Louis, Michigan, have elected THEODORE MARVIN chairman. Mr Marvin, formerly with Hercules Powder Company, Wilmington, Del, was made president of MCC on July 1, 1953. He will continue in that office.

WILLIAM F GOEDECKE, representative of Classe Ribbon Works and Tape-Craft, Inc, New York and Los Angeles, has announced the appointment of WILLIAM F GOEDECKE, JR and NORMAN BIRKENMEIER to his sales staff.

H F Creegan

THE James Hunter Machine Company, North Adams, Mass, has added to their staff HARRY F CREEGAN, former textile division manager of the Rodney Hunt Machine Company, Orange Mass. Mr Creegan, who has worked exclusively in the textile field since 1927, was chemist and colorist for the Eddystone Manufacturing Company, and head of the Dyeing and Finishing Division, Textile Research Department, American Viscose Corporation before going with Rodney Hunt in 1948.

ALLIED Chemical & Dye Corporation has announced the appointment of W W KNIGHT, JR, as vice president, Barrett Division.

For the past seven years, Mr Knight has held executive positions with the Libbey-Owens-Ford Glass Company, of Toledo. Previously, for a period of eleven years, he was with the Michigan Alkali Company.

As vice president of the Barrett Division, Mr Knight will be in charge of Barrett's industrial resin program.

ELY BALGLEY has been made supervisor of new product development for Heyden Chemical Corporation's Market Development Department.

Mr Balgley who has been associated with Heyden since 1950 was assigned to promotional work on new products in 1952 and, previously, served as group leader in charge of the applications laboratory.

CARL R DOLMETSCH has joined Mathieson Chemical Corporation in an executive capacity.

Mr Dolmetsch was general manager of the Viscose Division of Celanese Corporation of America until this division was merged in 1952 into a newly-created Textile Division. Since then he has been manager of viscose plant operations in Celanese' foreign service division, with headquarters in New York.

P J Luck

PAUL J LUCK has been named to the new position of general manager of Peerless Color Co, Inc, of Plainfield, New Jersey. Mr Luck was previously with Calco Chemical Division of American Cyanamid Company for 23 years and resigned his position with them as Metropolitan Sales Manager last summer.

Peerless was founded in 1916 by the late Dr R W Cornelison and it was one of the first producers of vat colors in the United States. Its products are distributed to other manufacturers and jobbers and consists of a line of black, blue, navy, green and yellow vats; direct Brilliant Flavine S; and Chloramine Yellow. Mr Luck states that no change in policy is planned.

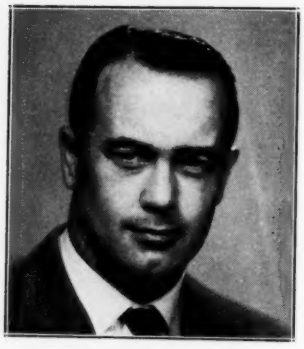
Mr Luck has been active in the American Association of Textile Chemists and Colorists for many years having served as Chairman and Councilor of the New York Section, Chairman of the National Publicity Committee, member of the National Publications Committee, and Co-chairman of the 1951 National Convention.

AT the October meeting of the Board of Trustees of the New Bedford Institute of Textiles and Technology, New Bedford, Mass, PHILIP MANCHESTER, Berkshire Fine Spinning, Inc was elected chairman of the board for the coming year to succeed JOHN SHEA, who has retired after 20 years on the board.

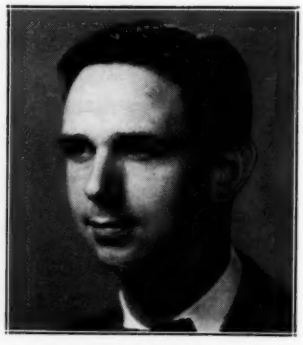
JOSEPH DAWSON, Knowles Loom Reed Works, was elected to succeed Mr Manchester as vice-chairman, and IDA EPSTEIN was re-elected secretary.

A permanent committee on education consisting of WILLIAM E KING, chairman, JOHN VERTENTE, JR and WILLIAM B FERGUSON was appointed.

THE appointment of BASIL G SKALKEAS as executive director of the Lowell Technological Research Foundation was confirmed on November 4.



F K Quigley



M C Carpenter

F B Wolcott

FRED K QUIGLEY, JR, in charge of development work on coating materials for textiles since 1948, has been appointed head of technical service and development activities in the field of latex paints for the Plastics Department of The Dow Chemical Company. Succeding him as head of the textile section of Coatings Technical Service is MANSON C CARPENTER, a staff member since 1950.

F. OTTO HAAS was elected vice president of the Rohm & Haas Company at a meeting of the Board of Directors on October 27th.

Dr Haas joined the company in 1939 as a research chemist. For the past two years his major activities have been in the Chemicals and Plastics Sales Division. He has been a director of the company since 1948. In 1951 he was named a vice president and member of the Executive Committee of the Board.

THE appointment of ROBERT F FRITZ as sales representative covering Pennsylvania, Maryland, Delaware, and Southern New Jersey has been announced by the Atlantic Chemical Corporation, Passaic, N J.

Mr Fritz has been engaged for the last 15 years in dyeing and similar functions with mills in the Philadelphia area.

THE following appointments have been confirmed at the Summit Research Laboratories of Celanese Corporation of America; RAYMOND A GOBEIL as head of the physical testing laboratory; JOSEPH A BERG, as head of personnel administration; and HAROLD K HAVILAND as associate head of the technical information section.

FRANK W TURNER has been named sales service engineer of the Marco Products Department of the Celanese's Plastics Division for the purpose of developing applications of reinforced polyesters in the building of tanks, pipes and other equipment in the chemical, oil and transportation industries. Mr Turner is being transferred from the Central Engineering Department of the company to assume his new duties at the Marco Products plant, Linden, New Jersey.

NELSON S KNAGGS, vice president in charge of sales, Hilton-Davis Chemical Company (A Division of Sterling Drug Inc) looks a 3000-year-old Egyptian gilded mummy mask used as part of the Company's exhibit at the recent AATCC convention in Chicago. As part of the exhibit pylon on "Textiles of the Ancients", ancient Egyptian textiles were shown underneath the mask.

RECENT appointees to the Philadelphia Textile Institute Board of Governors include: FREDERIC H BARTH, Industrial Rubber Co; LEON P BRICK, Onyx Oil & Chemical Co; J MARSHALL COLE, Cold Spring Bleachery; EDWIN L DALE, Pharr Yarns, Inc; HOWARD P GALLOWAY, Galloway Publishing Co; HORACE T GREENWOOD, Globe Dye Works; EDWARD G HAACK, General Dyestuff Corp; M EARL HEARD, West Point Mfg Co; WILLIAM I KENT, Kent Mfg Co; CARL C MATTMAN; EDWIN G MICHIE, Andrew Y Michie & Sons; ROBERT A RAMSDELL, Du Pont; EDGAR L SCHLESINGER, United Merchants and Manufacturers Co; JOSEPH SCHMITZ, JR, Universal Dye Works; RICHARD B STEHLE, Brehm and Stehle; and FRANK P ZURN, Alco-Zurn Co.

PERSONNEL news highlights from Wyandotte Chemicals Corporation, Wyandotte, Mich, concern the appointments of FRANK B WOLCOTT as vice president in charge of manufacturing, WILLIAM F WALDECK as director of research and development, and LESTER G LUNDSTED as director of chemical research.

In his new post, Mr Wolcott will also have supervision over Wyandotte's steamship fleet. He has been general manager of manufacturing of the company, in direct charge of the recently completed expansion program of their plants.

Dr Waldeck succeeds THOMAS H VAUGHN, who left Wyandotte November 1st to become vice president in charge of research and development of Colgate-Palmolive Company, Jersey City, N J. Dr Waldeck has served Wyandotte since 1939 as assistant director of technical service, assistant director of research and director of chemical research.

Dr Lundsted has been assistant director of research of the company since 1951.

Both new directors will make their headquarters in the newly completed Wyandotte Research Center.

CHARLES S MUNSON, chairman of the boards of Air Reduction Company, Inc, and of the Manufacturing Chemists' Association, accepted the Chemical Industry Medal for "conspicuous services to applied chemistry" at the October 30th meeting of the American Section of the Society of Chemical Industry.

HARRY B McCLURE, past chairman of the Section, and vice president of Carbide & Carbon Chemicals Corporation made the presentation. CRAWFORD H GREENWALT, recipient of the medal for 1952 and president of E I du Pont de Nemours & Co, Inc, introduced the medallist. LAUREN B HITCHCOCK, chairman of the Section, presided.

C Eubel

THE appointment of CURT EUBEL (Eubel Chemical Co) of Chicago, Illinois as Mid-western representative for Refined Products Corporation, Lyndhurst, N J was announced recently by Ralph Zoccolillo, president.

Mr Eubel was formerly general sales manager of the Pigments Division of United Wallpaper Company, prior to that being Chicago representative of General Dyestuff Corporation. He has been associated with the textile and industrial chemical industries for over 30 years.

HART Products Corporation, 1440 Broadway, New York, has employed DANIEL EPSTEIN as research chemist in the fields of textile, leather and paper specialties.

Mr Epstein brings to Hart experience with such auxiliaries as antistatic products, nylon coning oils, self-scouring wool oil, detergents, softening agents and leather compounds. He has also worked in the field of fugitive tints for the identification of yarns.

HOWARD J HEFFERNAN succeeds the late CLAYTON A WOLFE as director of the Purchasing and Traffic Department of Monsanto Chemical Company, St Louis, Mo. PRESCOTT SANDIDGE has been named assistant director of the department.

Mr Heffernan has been general manager of sales for the company's Merrimac Division since 1947, while Mr Sandidge has been director of the company's Personnel Relations Department since 1950.

FRANK GRILLI has joined the New York branch sales office staff of Diamond Alkali Company.

Active for many years with Innis, Speiden & Co, of New York, importers, exporters and manufacturers' agents of industrial chemicals, colors and allied products, Grilli was most recently manager of their resale chemical department. He will be located at Diamond's New York office, 122 E 42nd Street.

W T Meinert

A Moore

WALTER T MEINERT and ALEXANDER MOORE have been named to the Development and Service Department, Emery Industries, Inc, Cincinnati, O. Mr Meinert, a member of this department for the past four years, becomes assistant director. Mr Moore has also been with Emery for the past four years.

J E Larkin

ONYX Oil & Chemical Co, Jersey City, N J has named JOHN E LARKIN as technical sales representative covering western New England and upper New York state, replacing the late MALCOLM P COULMAN.

His former experience has been with: Bradford Dyeing Assoc, Bradford, R I; United Aircraft (Division of Hamilton Standard Propeller), Hartford, Conn; U S Rubber Co, Naugatuck, Conn; MacDermid, Inc, Waterbury, Conn; and Du Lite Chemical Corp, Middletown, Conn.

NEW appointments to the PTI faculty include the following:

WILLIAM A ENDRISS —— associate professor of microscopy and testing

GEORGE J GRADEL——instructor in chemistry

ROBERT BOKUM —— professor in charge of evening school

MARTHA E JUNGERMAN —— (Miss Jungerman, a Fulbright student at Leeds University last year, has returned and been given complete charge of the Color Department)

ERCAL KAISER——in charge of the Jacquard Dept.

NEW appointments for the Public Relations Advisory Committee of the Manufacturing Chemists' Association have been announced by William C Foster, President. HARRY S FERGUSON, Allied Chemical & Dye Corporation has been named chairman to succeed HAROLD BRAYMAN, E I du Pont de Nemours & Company, Inc, who has served since the committee's inception.

The following were named to serve as new members: D C CARMICHAEL, Diamond Alkali Company; MONTGOMERY R BUDD, Hercules Powder Company; ROBERT L TAYLOR, Mathieson Chemical Corporation; THEODORE MARVIN, Michigan Chemical Corporation, and C STUART HOAGLAND, taking the place of HENRY YOUNG, Interchemical Corporation.

RICHARD W IVERS is the new dean of students at Lowell Technological Institute. Mr Ivers continues to serve as director of admissions, a position he has held for the past 11 months. WENTWORTH WILLIAMS, former dean of students, is assisting with new duties in the Division of General Studies.

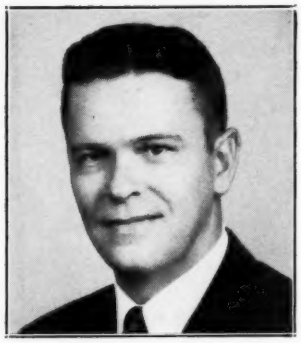
ARTHUR F HALEY, JR, formerly a senior library assistant at the Institute, is now assistant director admissions.

HARRY C BROWN has been promoted to the post of full professor in the Division of Engineering at Lowell. A former assistant professor in the Engineering Division, ADOLPH KATZ, has resigned to accept the position of assistant to the director of research for the LTI Research Foundation.

New LTI faculty members include: JOSEPH H ROSENBAUM, assistant professor, Chemistry Division; HORACE N LEE, Paper Engineering Dept, Engineering Division; and KENNETH S MERRILL, Cotton Yarn Department.

L Gussman

E P Lavoie



T P Caldwell

LAWRENCE GUSSMAN, president of The Stein-Davies Company, a manufacturing subsidiary of Stein, Hall & Co, Inc, has been elected president of the parent firm, succeeding MORRIS S ROSENTHAL, who resigned as president and director and as a director of Stein Hall's affiliated companies. Mr Gussman was a vice president of Stein Hall in charge of its Manufacturing and Technical Divisions.

* * * * *

E PHILLIP LAVOIE, formerly assistant superintendent of finishing at Erwin Mills, Inc, Cooleemee, N C, has joined Stein Hall's Charlotte sales staff as a sales technician. Mr Lovoie will call on finishing plants in the Carolinas and Virginia.

THOMAS P CALDWELL has joined the Fine Chemicals Division of Pittsburgh Coke & Chemical Company, Pittsburgh, Pa, as a dyestuff sales representative in the Greenville, S C area.

Mr Caldwell during the past seven years was sales representative for the Industrial Chemical Department, F H Ross Company, Charlotte, N C.

TECHNICAL LITERATURE

(Unless otherwise noted, the following trade literature may be obtained free of charge by writing on business letterhead to the address indicated.)

AMERICAN STANDARD L22——YOUR KEY TO BETTER TEXTILES——10¢; *American Standards Association, 70 East 45th St, New York 17, N Y*——outlines what the consumer can do to be sure he is getting serviceable rayon and acetate.

American Standard L22 is the name for the set of voluntary standards or minimum requirements for fabrics whose composition includes half or more of rayon or acetate fabrics. It was drawn up by a committee of 74 representatives of 30 national organizations, under the leadership of the National Retail Dry Goods Association.

The 16-page booklet tells the content and purpose of the new standard and explains how the consumer can use it to obtain a fabric that will meet the requirements of any of the 51 end-uses.

L22 is an effort of business and consumers to draw up common definitions that will mean the same thing to all the people who manufacture, weave, knit, dye, treat, cut, fashion, dryclean, launder, purchase and sell the fabric.

L22 contains a set of tags and labels used on rayon fabrics and garments, and a table entitled "Results You May Expect from Textiles Meeting L22 Requirements."

AMERICAN STANDARD MINIMUM REQUIREMENTS FOR RAYON AND ACETATE FABRICS——$4.25; *American Standards Association, 70 East 45th St, New York, N Y*——contains 51 end-use standards which set up minimum performance requirements. The standard is published in four parts, which can be purchased separately as follows: I—Women's and Girl's Rayon Wearing-Apparel Fabrics ($1.00); II—Men's and Boys' Rayon Wearing-Apparel Fabrics (80¢); III—Rayon Home-Furnishings Fabrics (65¢); and IV—Test Methods ($2.25).

ARMIDS——*Armour Chemical Division, 1355 West 31st St, Chicago 9, Ill*——describes the chemical properties and many applications of a series of high-molecular-weight aliphatic amides——the Armids (HT, O, and C) and Armowax.——24 pages.

ARRCOPEL W-18 (Technical data sheet W-117)——*American Resinous Chemicals Corp, 103 Foster St, Peabody, Mass*——specifications, properties, application data and shipping information on a wax-alumina water repellent.——2 pages.

AUXILIARIES FOR WOOL PROCESSING——*Antara Chemicals Division, General Dyestuff Corporation, 435 Hudson St, New York 14, N Y*——describes how Antara chemicals should be used in the many wet operations required to convert animal fiber into a wide variety of useful end products. Listed are the various steps associated with the preparing, dyeing and finishing of woolen and worsted fabrics.——46 pages.

AVISCO TEXTILE CHEMICALS——*American Viscose Corp, 1617 Pennsylvania Blvd, Philadelphia 3, Pa*——explains the role of Avisco's various nonionic waxes, lubricants, softening and antistatic agents in the processing of all major textile fibers. The book is divided into three sections: fiber preparation, yarn preparation, and the application of textile chemicals in dyeing and finishing.——40 pages.

BIRCH BROTHERS CIRCULARS——*Birch Brothers, Inc, 32 Kent St, Somerville 43, Mass*——the following

circulars on machines recently put on the market by Birch Brothers are available: #1146—2-roll quetsch of 15-ton capacity; #166—wide squeeze roll unit of 15-ton capacity; #1164—cloth opening & vacuum extracting range; #1153—patent "Supreme" butt-seam grey room sewing machine mounted on base fitted with casters to make it readily movable; #1186—ball-bearing high-speed counterbalanced tacking head; #1176—stainless steel, electrically controlled conical opener or spreader and guider; #1180—cotton-tufted carpeting finishing range; #1168—cloth measuring machine with yardage stamping counter.

CATALOG OF CHEMICALS——*Atlas Powder Co, Wilmington, Del*——data on seven classes of Atlas industrial chemicals——sorbitol, surfactants, mannitol, solid polyester resins, fatty acids, plasticizers, and activated carbons. The bulletin also presents the story of the company's development of industrial chemicals, and lists its service representatives in 15 geographical areas.——8 pages.

CERTAIN PROPERTIES RELATED TO THE SERVICEABILITY OF LIGHT-WEIGHT COTTON CORDUROY—*University of Alabama, University, Alabama*—a report of a study made through the research program of the Department of Clothing, Textiles and Related Art, School of Home Economics, Univ of Alabama, by Florence E Petzel, research associate.

The study was made of certain yarn and fabric properties related to the serviceability of four carded and four combed cotton corduroys obtained in 1951. As far as possible, the procedures followed were those of the American Society for Testing Materials. The yarn properties investigated included yarn number, twist, breaking strength, and elongation at break. The fabric properties studied were ribs per inch, count, thickness, weight, breaking strength, elongation at break, resistance to abrasion, dimensional change, and percentage of sizing.

COLTON VINAC POLYVINYL ACETATE SOLID RESIN——*The Colton Chemical Co, 1545 East 18th St, Cleveland 14, Ohio*——describes the properties, uses and applications of Colton Vinac Beads, now available as regular solvent-soluble types and as alkaline-soluble types in viscosities from 3-1000.

COMPLETE MONTHLY DIGEST OF GERMAN PATENT APPLICATIONS——*Research Information Service, 53 Nassau St, New York, N Y*——lists full particulars of a subscription service. Complete translated abstracts of patent applications being filed with the German Patent Office can be obtained in the form of monthly summaries.

CONSOLIDATED CHEMICAL INDUSTRIES CATALOGUE——*Consolidated Chemical Industries Inc, 630 Fifth Ave, New York 17, N Y*——celebrating the Company's 75th anniversary in the industrial chemical field, this catalogue contains a full account of CCI's history, growth, and numerous products. It is complete with photos of their 11 plants in the U S and Argentina.——104 pages.

CONTROLLING THE DISCHARGE OF HARMFUL WASTES INTO STATE AND MUNICIPAL SEWER SYSTEMS (Application Memo #600-K2)——*Builders-Providence, Inc, 345 Harris Ave, Providence, R I*——specific details and flow diagram on Builders RCB controller with pendulum unit, Builders Sightflo indicators and Builders FCV check valves—a "package control system" for meeting state and municipal regulations on the discharge of harmful wastes into sewer systems.

COOPER SPLIT ROLLER BEARINGS——*The Cooper Split Roller Bearings Corp, 700 Cedar Blvd, Pittsburgh 28, Pa*——a complete, well-illustrated bulletin with comprehensive data on the bearings, cartridges and pillow blocks for the medium, heavy and extra heavy series. Material on construction, housing, and assembly is included along with a section on the selection of the proper bearing.——16 pages.

CP VINYL COATING SYSTEM——*Prufcoat Laboratories Inc, 50 East 42nd St, New York 17, N Y*——details concerning Prufcoat's new corrosion-controlling vinyl coating system.——4 pages.

DECETEX 104 EMULSION——*Dow Corning Corp, Midland, Michigan*——includes typical properties and methods of applying and curing DeCetex 104 water-repellent finish.——4 pages.

DETERMINATION OF DODECYL DIMETHYL BENZYL AMMONIUM NAPHTHENATE IN TEXTILE MATERIALS——*10¢; National Research Council of Canada, Ottawa, Canada*——treats: ammonium compounds; quaternary-use as textile aids; fungus-proofing textiles; tests. Report No. PB 108598——8 pages.

DYNEL INNER STRUCTURE—*Textile Fibers Department, Carbide and Carbon Chemicals Co, 30 East 42nd St, New York 17, N Y*—describes "inner structure" techniques for studying fiber performance in many different types of fabric blends. Text and photos explain what "inner structures" are, how they are made, and their use in fabric quality studies and displays.

Studies of Dynel blends with wool, cotton, rayon and acetate are illustrated. Among the Dynel properties analyzed are pleat and press retention, shrinkage, wear life, reaction to ironing and fire resistance. Other suggested uses of "inner structure" studies are the checking of piece-dyed blends in dye houses, and analysis of the color fastness of individual fibers in a blend.—16 pages.

EASTMAN SERVICE——*Eastman Chemical Products, Inc, Kingsport, Tenn*——information describing laboratory services offered in Eastman's line of textile dyes and industrial chemicals.——20 pages.

EDWAL'S PRODUCTS, FACILITIES AND BACKGROUND——*Edwal Laboratories, Inc, Ringwood, Ill*——covers the company's 20-year history, financial position, operations, personnel, plant site, building space utilization, utilities, equipment particulars, and research facilities. Interior and exterior views of Edwal buildings are presented. For those already possessing the booklet, revision sheets are available.——24 pages.

EMERY 901-R AZELAIC ACID——*Emery Industries, Inc, Dept 5, Carew Tower, Cincinnati 2, Ohio*——discusses a superior grade of azelaic acid, a C_9. Includes tentative specifications, typical characteristics, composition data, and typical reactions.

FABRICS (7th Edition)——*$4.00; J B Lippincott Co, 333 West Lake St, Chicago 6, Ill*——five parts: Evaluation of Textiles; Fabric Definitions; Textile Terms, Processes, and Finishes; Standards for Textile Purchasing; References.——222 pages, 107 illustrations.

FOR ZINC DUST, TOO, IT'S FEDERATED FIRST (#141)——*Federated Metals Div, American Smelting and Refining Co, 120 Broadway, New York 5, N Y*——describes common applications of zinc dust, giving details on its advantages in the manufacture of bleaches, as a reducing agent, as a catalyst, purifier, precipitating agent, and additive.——4 pages.

FOXBORO DIAL THERMOMETERS (#467)———*The Foxboro Company, Foxboro, Mass*———provides data on temperature indicators of the vapor pressure and gas pressure types, emphasizing the variety of ranges, and the bulbs, tubing and accessories available.———16 pages.

FIBER FACTS———*American Viscose Corp, 1617 Pennsylvania Blvd, Philadelphia 3, Pa*———this 1953 edition devotes 2 pages to packaging data, supplementing the listing of all Avisco products. Other features include the latest data on the physical properties of all the major man-made fibers, an enlarged glossary of textile terms. Among the data included is a spinning twist calculator, denier conversion table, tables of warp and filling yarn requirements and yield, a bibliography of rayon publications, a fabric weight conversion table, tables of weights and measures, with the metric equivalents, centigrade and Fahrenheit equivalents, and 1953 and 1954 calendars. This is in addition to data about the corporation, including its ten-year record of shipments, number of employees, dividends, and market prices of its stock, as well as the addresses of all its offices and the names of its principal managers.

FIBERS AND FABRICS (#77)——— *Research Information Service, 53 Nassau St, New York 38, N Y*———abstracts, bibliographic information and prices on a wide variety of German patent applications and research reports. This bulletin is sub-divided into five sections: I—Cellulose Processing; II—Production of Acrylic Polymers; III—Fiber Production; IV—Processing of Textile Products; and V—Team Reports.———10 pages.

GAF BULLETIN M-104———*General Aniline & Film Corp, 230 Park Ave, New York 17, N Y*———tabulates the structures, physical form, availability, and suggested uses of a selected series of high-pressure acetylene derivatives.

GDC CIRCULARS———*General Dyestuff Corporation, 435 Hudson St, New York 14, N Y*———Circulars on Rapidogen Corinth IB-CF (G-724), Algosol Olive IT (G-736), Algosol Brilliant Orange IRKL Supra and Algosol Brilliant Orange IRKL Paste for Dyeing (G-741), Rapidogen Black 3G (G-742), and Monochrome Olive FBBL Conc CF (G-744) are among those now available. They present complete details, properties, uses, application procedures, and samples.

GEIGY BULLETINS ——— *Geigy Chemical Corp, 89-91 Barclay St, New York 8, N Y*———Among the bulletins currently available:

#1-A———Sequestrene NA4 with Chrome Dyestuffs
45-G———Diphenyl Brilliant Green G
46-G———Diazophenyl Brilliant Green G
47-G———Cuprophenyl Brilliant Blue 2BL

GUM ARABIC (Technical Service Bulletin #G-101)———*Morningstar, Nicol, Inc, 630 West 51st St, New York 19, N Y*———general information on the origin, physical and chemical properties, and mesh specifications of this natural gum. The bulletin describes grinding and processing equipment employed by the manufacturer to prepare grades of Arabic for various uses and comparisons are made with other water-soluble gums. Preparation of solutions, moisture characteristics and recommended preservatives are also featured.

HANDBOOK ON DEMINERALIZING (Bulletin 5800)—*Cochrane Corp, 17th St. below Allegheny Ave, Philadelphia 32, Pa*—explains the principles of ion exchange demineralization treatment of water. A series of curves enables estimates of cost of operation of such systems to be prepared. The design and operation of demineralizer systems—multi-stage systems and mixed bed units—are described and curves of water quality obtainable from the various systems are included. Operating results and flow diagrams of several existing plants are shown.—39 pages.

HATCH PRICE LIST———*Hatch Textile Research Inc, 25 East 26th St, New York 10, N Y*———a price list for laboratory tests, effective April 1, 1953.———4 pages.

HOW TO USE BENZOIC ACID OR SODIUM BENZOATE TO DYE DACRON———*Monsanto Chemical Co, Organic Chemicals Div, 1700 S Second St, St Louis 4, Mo*———gives step-by-step instructions for dyeing Dacron and Dacron blends, and includes charts for converting benzoic acid to sodium benzoate and on the solubility of benzoic acid in water.

INDUSTRIAL TEXTILES DIRECTORY (1953 Edition)———*$2.00; Fairchild Publications, Inc, 7 East 12th St, New York 3, N Y*———contains over 100,000 listings of sources for cotton and synthetic textiles, fibers, yarns, and finishes.

KETONES (F-4767)———*Carbide and Carbon Chemicals Co, 3 East 42nd St, New York 17, N Y*———discusses the 14 ketones sold in commercial quantities by the Company; their uses, physical properties, specifications, shipping data, and constant boiling mixtures. A bibliography is also included. Listed are four ketones available in research quantities, new products of Carbide's research labs. An important feature is the section devoted to specification test methods used by Carbide for its ketones.

KLAUDER WELDON GILES PADDLE WHEEL MACHINE———*Klauder Weldon Giles Machine Co, Adams Ave & Leiper St, Philadelphia 24, Pa*———describes in detail the new K-W-G stainless steel paddle wheel dyeing machine for sweaters, hose, and other garments, as well as tapes.———2 pages.

L&N MANUALLY OPERATED INDICATORS FOR TEMPERATURE, CONDUCTIVITY OR pH MEASUREMENTS (ND42)———*Leeds & Northrup Co, 4934 Stenton Ave, Philadelphia 44, Pa*———information on how manually operated, portable and panel indicators are being used. Instruments are arranged according to application.———24 pages.

LIGHTWEIGHT MATERIALS HANDLING EQUIPMENT———*Tobey Mfg Corp, 1221 El Segundo Blvd, El Segundo, Calif*———lists complete information on a line of all-aluminum, lightweight materials handling equipment, including trucks, A-frames, tote boxes, work tables and stack racks.

MICROMAX MODEL S INDICATING RECORDERS AND CONTROLLERS (ND44-1)———*Leeds & Northrup Co, 4939 Stenton Ave, Philadelphia 4, Pa*———describes and illustrates the design and standard construction features of the strip-chart Model S Micromax Recorder, the sequence of galvonometer detection, and typical circuits used. Complete with margin-index.———40 pages.

MONALOID TEXTILE STARCH STABILIZER (Tech Bull No. 209)——— *Mona Industries, Inc, 65-75 East Twenty-third St, Paterson 4, N J*———discusses the gelling of starch solutions and its prevention and points out how Monaloid improves starch mixes in many ways.

MONATERGE M AS COTTON DETERGENT (Tech Bull No. 208)———*Mona Industries, Inc, 65-75 East Twenty-third St, Paterson 4, N J*———outlines the use of Monaterge M on grey cotton goods and grey cotton-rayon mixtures.

NATIONAL MILLING AND CHEMICAL CATALOGUE AND MANUAL———*Department C, National Milling and Chemical Company, 4601 Nixon St, Philadelphia, Pa*———lists a complete line of soaps, detergents and cleaners. A complete section is devoted to products needed for the laundering of fabrics.

NEPHELOMETRY, A SHORT CUT TO PRECISION CHEMICAL ANALYSIS———*Coleman Instruments, Inc, 318 Madison St, Maywood, Ill*———explains in simple diagrams how a nephelometer works by measuring light reflected from particles in suspension. Only preparation and precipitation of the sample is needed.

NUTTING FLOOR TRUCKS (53-S)———*Nutting Trucks and Caster Co, 1467 W Division St, Faribault, Minn*———illustrates 32 different types of trucks for materials handling. Complete with specifications and descriptions.———16 pages.

PARAMUL REPELLENT DC-1 AND DC-2———*American Cyanamid Co, Textile Resin Dept, 30 Rockefeller Plaza, New York 20, N Y*———describes methods of applying the firm's line of Paramul water-repellent finishes.

PENFIELD MODEL M-100 MONO-COLUMN DEMINERALIZER———*Penfield Manufacturing Co, Inc, 19 High School Ave, Meridan, Conn*———contains photo, schematic diagram, description of parts, sample specifications, and performance data.———2 pages.

POLYCO 503 NONBLOCKING VINYL COPOLYMER FOR TEXTILE FINISHES (#P-48)———*American Polymer Corp, Peabody, Mass*———contains specifications, general characteristics, sizing procedure, and modifications.———2 pages.

PROCEEDINGS OF THE 1953 COTTON RESEARCH CLINIC———*National Cotton Council, 1832 M St, N W, Washington, D C*———contains the full transcript of all papers given at the February, 1953 meeting in Savannah, Ga, together with charts and illustrations.———125 pages.

PYROSET DO FIRE RETARDANT———*Textile Resin Dept, American Cyanamid Co, 30 Rockefeller Plaza, New York 20, N Y*———describes methods of applying the firm's line of Pyroset to impart fire retardancy to cotton, rayon, wool, mohair or combinations of these fibers.

RAPID COMPOSITION ANALYSIS OF COMMERCIAL STEARIC ACIDS———*Emery Industries, Inc, Dept 5, Carew Tower, Cincinnati 2, Ohio*———describes a simplified procedure for determining the composition of commercial stearic and palmitic acids. The test procedure, based on titer and iodine values only, and necessary curves are included.

1953-54 REFERENCE GUIDE TO DOW CORNING SILICONE PRODUCTS———*Dow Corning Corp, Midland, Michigan*———a description of each silicone in terms of operating and service characteristics of Dow Corning's silicones, including fifteen new products. The cross-reference application index includes three new categories.———4 pages.

RESLOOM———*Advertising & Public Relations Dept, Monsanto Chemical Co, Everett 49, Mass*———a complete collection of information on textile chemical treatments.

RODNEY HUNT'S ORANGE PEAL———*Rodney Hunt Machine Co, Orange, Mass*———this house organ, started in March of this year, is published every other month. Editorially, it attempts to treat each department of Rodney Hunt with one article in each issue, and carry some special story about Orange, Mass, with which the Company has been identified for 113 years.

SAFE, SURE, SEALING FOR AIR, GASES & LIQUIDS———*Franklin C Wolfe Co, Inc, 3644 Eastham Dr, Culver City, Calif*———describes the firm's standard products and services for sealing bolts, studs, rivets, AN fittings, access doors, hatch covers, flanges, electric terminals, etc. Write Dept L-101.———4 pages.

SCIENTIFIC ANALYSIS OF FLAVOR AND ODOR BY THE PANEL METHOD———*Evans Research and Development Corp, 250 East 43rd St, New York 17, N Y*———describes the method as used by Evans in their organoleptic laboratories. It shows how sensory testing can improve a product, and help establish advertising claims. Several case histories are presented.

SETHCO FILTER PUMP UNITS———*Sethco Mfg Co, 7078 Willoughby St, Brooklyn, N Y*———describes the function, design and application of corrosion-resistant filter pumps and equipment in the 50-100 gallon-per-hour range.———8 pages.

SEWAGE CHLORINATION — FACTORS IN SELECTING CHLORINE GAS FEEDERS (#840-J37)——— *Builders-Providence Inc, 345 Harris Ave, Providence, R I*———information on the purposes of sewage chlorination, types of chlorination, points of application, modes of control, types of feed, types of feeders, location of equipment, etc.

SILVER ANNIVERSARY ISSUE OF "CONSULTING SERVICE", 1953———*$1.00; Association of Consulting Chemists and Chemical Engineers, Inc, 50 East 41st St, New York 17, N Y*———On the inside front and back covers of this 14th edition are excerpts from Code and Ethics and Bylaws respectively. A table of contents, foreword and a page entitled "How to find your consultant" precede the following sections: I—Classifier; II—Scope Pages; III—Unusual Laboratory Equipment Owned by Members; IV—Index. Requests must include source of reference, name of person and company, and complete address.———144 pages.

SPECIALTY RESEARCH MONOMERS AND POLYMERS———*Nathan H Miller Advertising, 216 Tremont St, Boston 16 Mass*———the physical characteristics of over 300 specialty research monomers and polymers manufactured by Monomer-Polymer, Inc, are listed. In addition there are separate sections on catalysts and accelerators, monomers for polyelectrolytes, substituted ethylenimines, and cross-linking agents.

SPEED VARIATOR CALENDAR AUXILIARY DRIVES (GEA-5788)———*General Electric Co, Schenectady, 5, N Y*———shows how the G-E speed variator co-ordinates auxiliary sections and the main calender drive without lineshafts, chains, or mechanical speed changers. Special emphasis is given to specific auxiliary drives for fabric tension, fabric wind-up, plastic-film speed control, and plastic-film speed control.———8 pages.

STANDARDS ARE YOUR BUSINESS———*American Standards Association, 70 E 45th St, New York 17, N Y*———defines standards of production and their value as tools of management. The booklet gives the philosophy and objectives

of the voluntary standards movement in this country and contains new material, including a section on Federal Government policy towards industry standards. ———24 pages.

STEARATE PROPERTIES———*Metasap Chemical Company, Dept 72, Harrison, N J*———describes a complete line of stearates and their properties and applications.

SYMPOSIUM ON CONDITIONING AND WEATHERING———*$2.25 each; Headquarters, American Society for Testing Materials, 1916 Race St, Philadelphia 3, Pa*———Sponsored by ASTM's Committee E-1 on Methods of Testing. Some of the papers included are as follows: "Fundamentals of Atmospheric Elements", "Air Conditioning in the Manufacture and Testing of Textiles", "Laboratory Air Conditioning", "Outdoor Exposure Testing on Racks and Test Fences", and "Accelerated Weathering Devices".——— 104 pages.

TAB-A-TEX———*Thurston & Braidich, 286 Spring St, New York 13, N Y* ———contains information on a product of interest to the textile printing industry.

TABLES OF CONTENTS OF TRANSLATED RUSSIAN CHEMICAL JOURNALS———*Consultants Bureau, 152 West 42nd St, New York 18, N Y*——— These tables are issued simultaneously with each issue of the translated journals. Any paper listed in the tables may be purchased in complete English translation for $7.50.

TALL OIL IN INDUSTRY———*Tall Oil Association, 122 East 42nd St, New York 17, N Y*———a consolidation of the following bulletins: Something About Tall Oil, Tall Oil and Its Uses; Handling Tall Oil; Tall Oil Testing Methods; Tall Oil in Drying Oils; Tall Oil in Soap Products; Tall Oil in Core Oils; Driers and Metallic Soaps; Tall Oil in Emulsions; Tall Oil Esters; and Tall Oil in Ore Floatation.

TALL TALES AND FABULOUS FACTS———*Dow Corning Corp, Midland, Michigan*———the 10th Anniversary publication of Dow Corning Corporation. This "New Frontier Edition" uses a clever technique———on opposing pages the reader goes from "tall tale" to "fabulous fact". The "tall tales" represent a collection of classic stories recapturing the self-confidence and humor of our forefathers. The "fabulous facts" relate to the growth of the silicones to demonstrate that, in our times, some of the tallest tales are told in technical terms.——— 24 pages.

TECHNICAL BULLETIN C-3-180 ———*Koppers Company, Inc, Chemical Div, Koppers Bldg, Pittsburgh 19, Pa* ———properties, uses, applications and characteristics of four Koppers polystyrene emulsions, stable water dispersions of high-molecular-weight polystyrene. Comprehensive instructions for use are included along with tables listing compatible organic and inorganic pigments. ———32 pages.

TEXTILE MILL CLEANING GUIDE ———*Oakite Products, Inc, 154A Rector St, New York 6, N Y*———based on work now being done in mills throughout the country, this booklet discusses textile washing operations, equipment cleaning procedures, and humidifier maintenance. It gives operation instructions———materials, concentrations, temperatures, and methods———for cleaning a wide variety of equipment. Completely indexed, the booklet also describes Oakite methods of removing and preventing rust, removing scale, stripping paint, and cleaning with steam detergents.———32 pages.

TEXTILES AND TESTING COURSE OF STUDY———*$2.75; Consumer Service Div, United States Testing Co, Inc, 1415 Park Ave, Hoboken, N J*———a work book used in the Company's annual Refresher Course in Textiles. The book is presented in outline form and is illustrated with sketches, photos and sample test reports. The major chapter headings are as follows: Introduction to Testing, Raw Materials of the Textile Industry, Yarn Manufacturing and Testing, Fabric Manufacturing & Analysis, Hosiery Testing, and Chemical Tests in Fabrics & Dyestuff Analysis.———96 pages.

"TEXTRACTS"———*J B Goldberg, 11 West 42nd St, New York, N Y*——— a monthly summary of domestic and foreign textile news, technology and patents. Each issue contains from 60-80 items, condensed from over 150 papers and magazines every month. Annual subscription rate (monthly): $20.00.

THE CHEMISTRY OF THE FERROCYANIDES———*Industrial Chemicals Div, American Cyanamid Co, 30 Rockefeller Plaza, New York, N Y*———presents a summary of the known physical and chemical properties of sodium and potassium ferrocyanides and of hydroferrocyanic acid together with known and proposed applications.

THE COPYRIGHT OFFICE OF THE UNITED STATES OF AMERICA——— *Register of Copyrights, Library of Congress, Washington 25, D C*———prepared last year for the purpose of explaining the place the Copyright Office occupies under the copyright law, and the services it renders, and also, to provide a partial list of its publications.———24 pages.

THE MAGIC OF TEFLON FINISHES ———*General Plastics Corp, 1011 Main Ave, Clifton, N J*———outlines the applications of "nonsticking" Teflon polytetrafluoroethylene finish to textile processing machinery.———4 pages.

VINAC POLYVINYLACETATE EMULSIONS—*Colton Chemical Company, 1545 East 18th St, Cleveland 14, Ohio*—describes uses, applications and properties of various grades along with a section on handling and storage.

WHAT DO YOU WANT TO KNOW ABOUT ACRILAN———*Chemstrand Corp, 350 Fifth Ave, New York 1 N Y* ———describes the characteristics and features of the firm's acrylic fiber and illustrates by diagramatic flow chart the 14 basic steps involved in its manufacture.

WHAT'S DOING———*Alrose Chemical Co, Box 1294, Providence 1, R I*——— a second bibliography covering the 1952 literature on Sequestrene (ethylenediamine tetraacetic acid) as well as a number of earlier papers.———8 pages.

WITCO CATALOGUE (6th Edition) ———*Witco Chemical Co, 260 Madison Ave, New York 16, N Y*———information regarding Witco's products, plants and technical literature. The firm's entire line of chemicals is described as to type, form, properties, applications and packing.

YEAR BOOK OF THE TEXTILE INSTITUTE (No. 5, 1952-53)———*Textile Institute, 10 Blackfriars, Manchester 3, England*———contains data on the Textile Institute and its standards, a bibliography and library catalogue, which in itself is a comprehensive bibliography, addresses of textile organizations in England and other countries, and tables of yarn counts and conversion factors.——— 142 pages plus address list of members.